RAILROAD GAZETTE

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COMBINED SAFETY VALVE AND WHISTLE.

Our engravings represent a recently invented safety valve which has been tried and highly commended by excellent authority. It is so arranged that, when the boiler pressure exceeds the limit allowed, the steam escapes with a rush until the excessive pressure is relieved, and, being combined with the steam whistle, the valve stem is frequently moved, and the possibility of the valve adhering or sticking to its seat is avoided.

Figure 1 is an exterior, front view of the safety valve and whistle complete, and detached from the boiler. Figure 2 represents a side of the same, with a portion of the bell removed. Figure 3 is a section, showing the attachment to the boiler and Figure 4 shows a portion of the dome cap at the point of attachment.

E represents a yoke, inside the dome, by means of which, and the screw bolt *D*, the base of the case, *A*, is held firmly upon the dome cap; *a*, *a'* *a'* *a'* are steam spaces between the arms, *C C*, which connects the base of the case to the hub through which the screw bolt passes. *F F* is a steam-tight bulk-head over the main valve, *H H*, and *d' d'* are the discharge ports from the main valve, *K*; *h h* is the primary valve stem which has its seat, *K*, in the bulkhead.

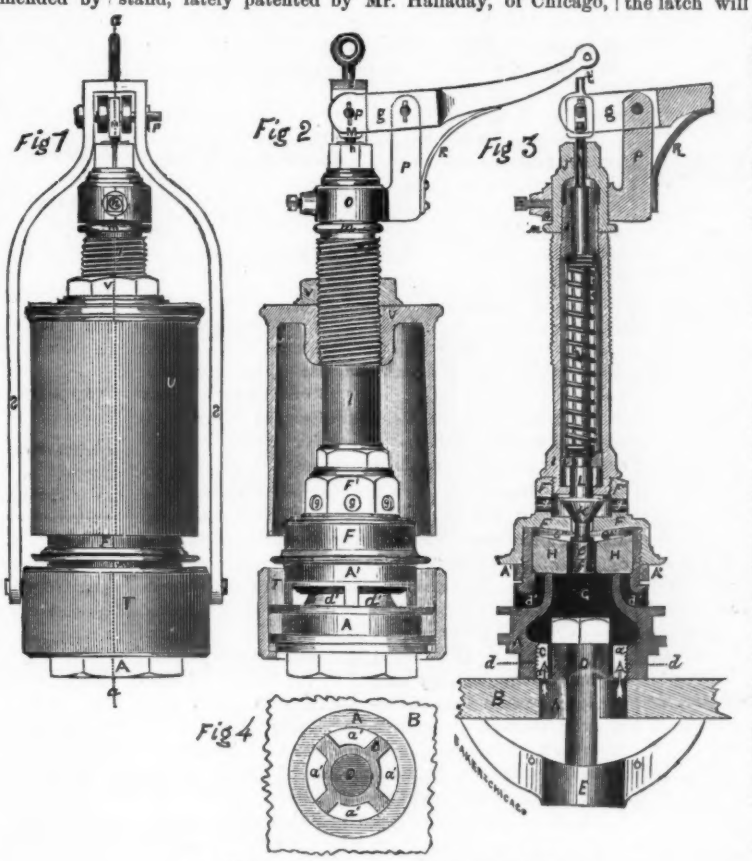
The main valve, *H*, *H*, has a small hole through its center into which an enlargement of the primary valve stem projects, and around this the steam constantly leaks from the boiler into a chamber, *G* immediately *above* the main valve; the horizontal area of this chamber is more than two times the live steam area, *G*, of the under side of the main valve. The consequence of this is: as the steam is generated in the boiler it leaks into the chamber, *G*, and its pressure *down* upon the *main* valve is more than twice the pressure up upon the same; and the greater the pressure of steam in the boiler the more firmly will the main valve be seated. When the steam in the boiler exceeds the limit of pressure allowed, the primary valve at *e* is raised from its seat thereby exhausting the steam in the upper chamber through the ports *g g*, which allows the main valve to rise promptly and free the boiler from excessive pressure of steam, when the spring causes the primary valve to re-seat, and the upper chamber is again charged with live steam, which immediately re-seats the main valve.

This operation will be repeated as often as the pressure of steam in the boiler is in excess of the limit allowed, the main valve re-seating with a loss of only about two pounds of steam.

The lower end of the primary valve stem is enlarged in order to regulate the leak of steam into the chamber *G*, and also to give a prompt, strong movement to the primary valve when it starts up. The spring, *N*, is set to effect any desired pressure by the hollow nut *J*. The main valve is allowed a play, or lift, of from one-sixteenth to one-half inch, and this is regulated by an adjusting nut which encircles the case just below the bulk-head.

The whistle lever, *g*, is so connected that, when the longer arm is depressed, the primary valve is raised and steam is allowed to escape; at the same time, by means of the bail, *S S*, the annular sheath, *T*, is lifted so as to direct the current of steam toward the mouth of the bell, *U*.

The valve, as may be seen, can not be tampered with, and, also, they are made entirely of non-corrosive metal. Mr. G. H. Clemens, the inventor, is at Room 8, Steel's Building, Chicago.



Combined Safety Valve and Steam Whistle.

THE HALLADAY SWITCH-STAND.

We present an illustration of an improved switch-stand, lately patented by Mr. Halladay, of Chicago, and now being manufactured at David M. Ford's works on West Washington street. The switch lever is provided with a latch, like that attached to the reversing lever of a locomotive, so that the operator, grasping the lever, can, with one hand and one motion, detach the latch from the notch in the quadrant and throw the lever forward or backward to its proper place, where the latch will be in readiness to drop into its notch. It is locked by passing the link of a padlock through a hole in the lever, just above the latch. When the track is frozen, or, in making a "running switch," this latch attachment will be found convenient as the lever can be worked by both hands, without being obliged to take out and readjust a pin.

The Halladay Switch-Stand.

Contributions.

SOME DEFECTS OF OUR RAILROADS AND ROLLING STOCK.

The advocates of the narrow-gauge railroads are still claiming that in their construction, as well as operation, a great degree of economy can be realized. It must be admitted that such may be the case in some instances, because independently of any mechanical advantages, the comparative reduction in first cost of rails and rolling stock, and consequently in the amount of borrowed money, must contribute essentially to a favorable result, especially where the business of the road comes within its capacity. The necessity of lighter rolling stock and lighter rails is, however, the principal cause of success; for it diminishes the general expenses. Although such is the case, the number of trains are necessarily increased.

What are the difficulties in the way of dispensing with a portion of the immense amount of dead weight now carried on the 4 ft. 8½ in. gauge? If we trace in the history of railroads the gradual changes which took place before the present system was adopted, it will be found that in the early periods of their existence, as might naturally be expected, many expedients were resorted to in order to perfect and adapt them to general use. Among the prominent elements were the form of the rails, as well as of the tread and flanges of the wheels. At first the corners of the rails were but slightly rounded, the tread was perfectly horizontal while the wheels were allowed to revolve on the axle, with a view of facilitating their passage around curves. The liability, from these arrangements, to create much attrition between the flanges and the rails soon became apparent, while it was also evident that a tendency was thereby given to run off the track; for in spite of the utmost care in securing the axles at right angles to the frames of the cars, it failed to counteract this tendency. Wheels tight upon the axles, with the tread slightly conical, and with the angle between the flange and the tread handsomely rounded, were ultimately adopted, and, with some modifications, have become the basis of the present system. Mechanically, however, it involves consequences which have only been received as a necessary evil. One of the results, in adopting the tight conical wheel, with a play between the flanges and rails of three-fourths of an inch on each side, is the creation of a constant vibration of the cars in their onward progress. This vibration or side thrust, as it is usually termed, increases considerably at high velocities, and the degree of resistance arising from it is said to be increased in still greater proportion.

Whatever it may be, it evidently adds immensely to all the strains to which the rolling stock is exposed, and to the expense of maintenance of way. The experiments of Baron von Weber have demonstrated most clearly the terrible force of the side thrust, by its effect on the heaviest T rails.

In England, where the work of forming the roadbed has, usually, been more perfect than in the United States, lighter cars are made use of; yet even there excess of dead weight has been resorted to in consequence of the irregularity of motion inseparable from the present defective system. In the United States, in consequence of the rapid and imperfect manner in which most of our railroads have been built, the introduction of eight-wheeled cars on bogies or trucks became a necessity, and with it came the necessity of greater complication, higher center of gravity, and a much larger proportion of dead weight. The 4 ft. 8½ in. gauge, therefore, has been accompanied with expenses that are much diminished by the light rolling stock of the narrow gauge.

With all the mechanical defects, however, of the present system, if some of our great lines of railroad had simply confined themselves to locomotives of 18 or 20 tons, multiplying slightly the number of their trains, and had put a proper limit to the speed to be adopted, it would most assuredly have saved a very large share of their operating expenses and in the amount of their earnings absorbed by repairs of rolling stock and permanent way.

The true and most effectual mode of correcting the evils attending the operation of railroads is to construct them in conformity with the natural laws of motion. The substitution of one mechanical error to compensate for another does not denote true progress. The present railroad system, with all its magnificent results, is a mass of mechanical errors. Thousands of millions of capital have been wastefully expended in construction, and millions are every day wasted in the transportation of useless dead weight. The period for reform has arrived, and if the narrow gauge does nothing more for the community than to lead mechanical ingenuity in the right direction, it will have been of great service to the country.

R. P. Morgan.

NEW HAMBURG.

BY WM. S. HUNTINGTON.

Now that the excitement caused by the New Hamburg disaster has somewhat abated, and the officers of the road have received the full measure of abuse usual on such occasions, and after every one has expressed his opinion as to the cause of the accident and suggested means of preventing such calamities in the future, a little cool reflection on the subject may not be unprofitable. The newspaper men, in their eagerness to furnish the public with full particulars of the calamity, do not lose any opportunity to fire the public mind by the most extravagant statements of the "gross carelessness and criminal neglect on the part of the "officials." It is true that in some cases (and they are far too numerous), the managers are deserving of the severest censure—in fact deserving of punishment. It should be remembered, however, that railroad superintendents are but human, and that there are many causes of accidents utterly beyond the control of any human agency. That a general reform in railroad management is much needed, no one will deny; but it is difficult to see in what way the managers of the Hudson River road could have prevented the accident at New Hamburg by any system of management.

It is usual for people in discussing the causes of serious accidents to make use of a great many "ifs," and so in this case. *If* the accident was caused by the breaking of an axle (which is not yet clearly proved), it might have been prevented by subjecting it to a severe test before putting it to use, as all axles should be. Right here seems to be a chance to attach some blame to the officials of the road. *If* the axle was one of a cheap lot purchased at a low rate, as a matter of *economy*, it should be considered a misdemeanor, and a proper punishment should be meted out to the guilty ones. It may be, however, that the broken axle was one of a choice lot and considered safe. Perhaps it had been tested, and the strain to which it had been subjected in undergoing the test might have injured the axle so as to cause its breaking. It is believed that steam boilers are often injured by the process of testing; although at the time they do not exhibit any signs of weakness, they frequently fail at pressure far below the test, under circumstances that lead to the conclusion that the strain during the test was the cause of the very mischief it was designed to prevent. It is therefore unreasonable to suppose that a railroad can be operated without liability to accident, even under the best management. The breaking of axles is alarmingly frequent on some roads, while on other roads such accidents rarely, and on some roads *never*, occur. At all events, when it is known that the managers of a road make use of all known precautions for the prevention of accident, they should not be branded as murderers on the occurrence of a fatal accident which is clearly beyond their control.

It is lamentable that more *facts* are not elicited at coroners' inquests than is usually the case. It appears that in this case the testimony commences after the accident to the oil train; that is to say, it was taken for granted that the breaking of an axle was the cause of the accident to the oil train, and the only point to be investigated was whether the accident to the express train could have been prevented by proper management on the part of the officials, and prompt action on the part of the employes. It would seem that the principal point of investigation should have been the cause of the breaking of the axle of the oil car, to ascertain if possible whether it broke before or after the car left the track. If the former, how far it was due to the action of frost, defective material or workmanship, and whether it was one of a lot of cheap axles, or whether it had ever been subjected to any test, and all matters of interest having any bearing in the case that would be suggested in the course of a rigid examination. The whole force of the examination at the inquest seems to have been to ascertain how far the officers of the road may be blamed for the disaster to the express train, on the supposition that the accident to the oil train was unavoidable. Now this is not getting at the bottom of the affair. If it should be proved beyond question that the accident to the oil train was the result of bad management, or in any way chargeable to the officers, then the weight of the whole calamity rests on them. Nearly all the conclusions that can be arrived at from the evidence at these inquests, as they are usually conducted, is, that "the victims came "to their death by a railroad accident." As to the cause or causes of the accident, but little is known; nor is there any effort made for information that may lead to the prevention of similar disasters. The general impression goes forth that the accident is the result of carelessness, and there the matter rests.

Railroad managers are often charged with carelessness without the slightest reason. I was somewhat amused a few days since to hear a man charging the officers of the Hudson River road with the grossest carelessness. He was laboring hard to convince a crowd in the street that the recent affair on that road was purely the result of carelessness. Now this man a few years since lost a child by drowning in a cistern. He had been repeatedly warned of the danger of leaving it uncovered, but paid no attention to it. A year or two afterward he left a vial of deadly poison on the table for a few minutes, and he lost another child by poison. I have just read an account of a man locking up his house in the evening and leaving it with six children, when on his return his children were burned to cinders. Every paper we take up contains an account of a loss of life in some careless manner, and probably if either of the men above mentioned had lost a child by a railroad accident they would consider the superintendent of the road a murderer. When people are entirely regardless of their children's lives, and equally regardless of their own, it seems unfair to be severe on railroad men who have thousands of lives in their hands, if by some unavoidable accident some of these lives are lost. Some argue that the company is to blame for not building an iron bridge in place of the wooden one which was destroyed. Probably if the creek had been spanned by a substantial iron bridge the accident to the express train would have been less frightful, but it would not have prevented the accident to the oil train. Custom has much to do with railroad management in this country, and it is not customary to replace substantial modern bridges with iron until the wooden ones become unsafe. Well constructed wooden bridges were always considered safe in this country until the introduction of iron, and it is but a short time since the superiority of iron bridges was established here. New roads at the present day are not considered first-class unless the bridges are of iron, and old roads are building them in place of wooden ones as fast as safety demands it. If the bridge at New Hamburg was a *good one*, the officers should not be blamed for its being a wooden one, if they considered it safe. It is also argued that the accident could have been prevented by placing signal men along the line, as is done in France and some other countries. This is doubtless a good plan, and should be adopted in this country, or at least thoroughly tested. There is room for doubt, however, about the safety of the express train being insured by this system of signals. A very short time elapsed between the accident to the oil train and that of the express. Being in the night, it is not certain that the signal men would have comprehended the situation in time to have stopped the express.

Although the Hudson River road has met with many misfortunes since its completion, it has been as carefully managed as most roads in the country. It was one of the first, if not the first, to adopt the Creamer patent brake, which has always been considered very efficient and reliable. The general equipment of the road will compare favorably with that of any other road.

The circumstances attending the recent disaster are somewhat peculiar and it will require a more thorough investigation than is usually made on such occasions to determine where the blame should rest, or whether there is any one to blame. If the door of the sleeping car had not been locked, several of the victims could have escaped; but it appears to be the custom to lock sleeping cars, and therefore we cannot reasonably blame the conductor for having it locked, inasmuch as he perished with the rest. There should be a law enacted to prohibit the locking of passenger cars while running. We seldom hear of a serious accident where there are not some lives lost on account of the cars being locked. The practice is a wicked one and should be abandoned.

But whatever may be the conclusions in regard to the guilt or innocence of the managers of the Hudson River road in this affair, it affords an opportunity for railroad men and the general public (who are equally interested) to gain information that will be of use in the future. The subject of the State or the General Government assuming control of the entire railroad system is now revived, and no doubt a little wholesome legislation would be beneficial, but those who have the handling of the matter should not go too far. It would be well enough, however, for the authorities to go so far as to prohibit the railroad companies from allowing their roads to become unsafe for the sake of squandering their surplus cash for brass images.

RAIL RIDING—RULES AND REGULATIONS REGARDING THE SAME.

Eggs during lent are good and allowable, but spoiled eggs are good for nothing, and good nowhere.

Car-riding is a luxury of modern life, but nearly spoiled and rendered a nuisance by the bad eggs with which it is almost everywhere mixed.

Calvinism is flouted and disowned by most polite and sensitive people now-a-days, but a constant car-rider becomes orthodox, *nolens volens;* for he sees total depravity demonstrated daily, and he can't get rid of the unwelcome conviction if he would.

Such being the fact, what is to be done? Can't it be covered up, "cribbed and confined" in some way, or "*regulated*" *a la* St. Louis, so as to make it more tolerable, at least?

People once abroad throw off the crust of reserve that usually distinguishes them at home, and act out "natur"—awfully; and when thus denuded, many of them are astonished to find themselves so well prepared to replenish a first-class brush factory with its most essential material. But so it is.

Rail cars have become a species of free cage for an ungoverned menagerie, and it is time a keeper and regulator went in and reduced chaos to order, and substituted comfort and content for the vexations and discomforts that are now so universal. It can be done, and railroad officials should do it. Let us see how, in a few particulars:

1. To enter the car is a pre-requisite of rail-riding. The passenger should have a chance to get in to the vehicle without breaking his ribs—or his church relations—by the crowdings and cursings that are apt to attend such an operation; for very frequently the ingoing and the out-going masses meet on the narrow steps of the car, all equally anxious to be off, or to be on, and the result is, a muss and a mad that are not forgotten during all the rest of the day. To prevent this, how easy. Let it be a rule of all trains, that out-goers take the rear, and in-comers have the front door to themselves, and all this vexation would be obviated at once; and then, also, with what facility would seats be secured! No further pouting, pushing or disputing over *that* question.

2. But once in the car the passenger needs guidance and protection still, and railroad companies should have officials specially charged with this particular duty. The selfish and swinish travelers are perpetually trenching on the rights of others, and they need spudding into order, just as does the great lazy bullock in the *real* cattle-car, when he insists on lying down and half killing the smaller steers and heifers, unfortunately car'd with him for the time being.

Car seats are designated for the accommodation of two persons. He or she who pays for one seat only, has no right to occupy *two*. And yet, *a real fine lady*—one with the smallest bonnet on her head, and biggest rings on her fingers—will hardly be satisfied with less than four, certainly. She will want all of one wide cushion for her dear little self, and the one in front must be turned

back, to hold her reticule, fan or parasol. Behind her perhaps, is a liquor-house bummer, occupying two or four more seats, and dreaming off the effects of a previous night's "engagement" with some one or more of his customers; and other monopolists are spreading themselves quite as extensively in other parts of the car, while modest and untraveled people are standing or resting themselves on the wood-box.

Now there should be no parleying with this sort, at all. It is the company's duty to give them what they pay for and no more. Teach them circumspection—and the awful fate of the frog who tried to puff himself up to the dimensions of the ox. It is dangerous to do so, and a great mercy to tell them of it. Madame's skirts may be very vast but she is but a little body after all; and these attempts at attenuation are hazardous. She might not be able to find herself when wanted, if spread out too thin, and she should therefore try to keep within bounds. At any rate, all such lawless outspreads should be "tucked up" and kept in place by somebody, and, if done by authority, no one could complain.

3. Cars are the common resort of the public and should be run and used for the public rather than individual interests. To that end, general plans involving ventilation, temperature and cleanliness, are of the first importance. Least of all should simpletons and children be permitted to meddle with these important adjuncts of the traveler's comfort. The company ought to provide against freezing, suffocation and filth, as it would against detention or accident; and to arrest pneumonia from an open window, for the same reason that it would not employ an idiot as an engineer. For the mode of destruction is unimportant. Does a railroad company claim the right to kill us, either by concussion of brain or congestion of as vital an organ? We protest, however, against both modes of exit, and demand as of right exemption from brainlessness on engine and car alike. And yet, folly among meddling passengers is doubtless more fatal to travelers than ignorance and carelessness among railroad employes.

And for all this railroad companies should account. If they transport incompetents, keep them in place; don't let them vex people who have rights themselves and are willing to respect the rights of others.

To this end, a "comptroller" is as important as a conductor. Both would have duties, but that of the "comptroller" would be of most moment to the public. Such an official should have control of and be responsible for his car or train, to all intents and purposes. He should heat by thermometer and keep ventilators quite at his direction; repress officious ignorance when it would meddle with the poker; and gently hint to artless Miss Beaver, that laying aside some of her furs would obviate the necessity of an open window, and perhaps prolong the life of the old and thin-clad mother opposite, whose cough is already bad and will be worse to-morrow if she is compelled to sit in a chilling draught thus created. Madame will pout a little at this, doubtless, but even she, selfish and thoughtless as she may be, would hardly go into this old lady's dwelling and open a window without leave, however urgent the necessity. And yet, how have the rights or duties of either been changed by this temporary change of circumstances?

The "comptroller" should also insist upon personal decency in his car. Spittoons are a nuisance anywhere, and uncalled for among really cleanly people, but might be tolerated, possibly, in a car. If there, squirters should be compelled to use them or seek a more appropriate place in a pig-car. Many a dress, skirt, hose, shawl, etc., etc., has been ruined by following a tobacco expectorant into a recently evacuated car-seat. The grease and debris of a family lunch are often nearly as bad, and would come legitimately under the same control. If people won't volunteer to be godly, compel them to be cleanly if possible, as this is a kindred virtue and may help save them at last.

There are many other things for the "comptroller" to do, but we can only hint at them just now. He should keep seats clear of baggage, and dogs, and baskets of live poultry, and feather beds, and peddler's packs out of his car, and utterly forbid fire-arms, old muskets, rifles and horse-pistols within his enclosures. These things are a nuisance, and always entirely out of place among gentlemen and ladies. But, more anon.

IRON POINT.

Connecting Rods—Railroad Accidents.

PEORIA, Ill., March 5, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I noticed in a late number of your paper an article on coupling-rods, that you close it by asking practical men to write and give you the results of their experience, though I believe you said that you did not want simply opinions, but facts. Now when two men whose opinions are entitled to equal weight hold exactly opposite opinions on any question, like the one under discussion for instance, it is always a little doubtful which is right; but in the case of the coupling-rods, my experience leads me to believe that the theory which you advocate is correct—that when the wedges are up tight and there is no pound in the *driving journal*, there is none in the rods. It is often the case that rods having considerable side play, make so much noise on passing the dead points, by slipping sideways, that the engineer thinks his rods are too loose, and has the brasses filled, when, in fact, they are tight enough. This is often the case with both side rods and main rods, though I doubt whether even this happens on side rods when the wedges and journals are both free from pound. I have not written this for publication, but simply to give you the results of my experience on the question of rods, considering myself one of the invited, having had nearly twenty years' experience in railroading, and mostly in the locomotive department. I am am running an engine on the Peoria Branch of the Chicago, Rock Island & Pacific Railroad.

I see a great deal in your paper, and since the disaster on the Hudson River road in all the papers, about railroad accidents, nearly every writer having a way of his own for preventing all kinds of accidents. I am one of those who believe that accidents will happen in the best regulated families and on the best managed railroads, though I have no doubt that many of them might have been avoided. I will only say now, that if railroad companies would employ fewer boys and more men, and try and make the whisky shops along the roads a little farther apart, it might have a good effect on dividends. In this I don't want to be understood as alluding in any way to the Hudson River, or any particular accident, but simply to hint at what I believe to be the causes of a great many accidents resulting in destruction of property and sometimes loss of life.

[As our correspondent says that he does not write for publication, we withhold his name, but what he says is certainly worth publication and serious consideration as well.—ED. RAILROAD GAZETTE.]

SIMPLE RULES FOR LOCOMOTIVE ENGINEERS AND MACHINISTS.

[CONTINUED FROM PAGE 411.]

That it would be of great utility to the operative force of the motive-power department of our roads were the means of acquiring a knowledge of the general principles of steam machinery afforded, cannot be denied. I know that a conviction exists in the minds of the most eminent railroad managers, that their men are very much deficient in qualifications of this sort, and I am equally certain that such qualifications are looked upon as very desirable. Everything that could make a body of engineers more intelligent and reliable, would make them more valuable, and the first step in increasing their capabilities would be to afford them the means of forming sound judgments. I am well enough aware that difficulties attend all advances of this sort; it is difficult to engage the attention of men who feel their duties to consist in action rather than reflection; it is difficult, also, to overcome the prejudices of men, and a certain jealousy which is felt upon any intimations towards them that they *can* be taught. It is quite as difficult, perhaps, to find proper persons well qualified to converse with engineers and machinists and it is difficult, indeed, to find instructors who would be fully competent.

The qualifications of such an instructor should be of a rare practical quality, such as would enable him to preserve a just self-respect on the one hand, and on the other a facile, ready and agreeable manner of holding the attention and of adapting his language and illustrations to the capacity of his audience. The hardest task to be overcome by any such instructor would be that of allowing fully for the *practical* attainments of those to whom he would seek to impart *theoretical* knowledge. He would need to be not only sound in theory, but equal in practical knowledge to the most intelligent of his auditors. Proper talent once secured, and a suitable programme once adopted for this purpose, every man deserving to continue in his employment of engineer or machinist, would improve rapidly under it. I cannot think otherwise without impairing my own opinion of the capacities of this class of men. Our engineers would not only then become able to determine, upon intelligent principles, the power, service, economy and kind of management due to any plan or proportion of engine, the best adjustment of its parts, the best adaptation to any particular service, and its general fitness or unfitness, perfection or imperfection, for specific uses, but they would acquire habits of observation and inquiry which might lead to highly useful results, such as improvement in construction, or economy in management.

Such a course of instruction must commence at the foundation—where the simple rules of arithmetic leave off—perhaps even at the commencement of these rules. Nothing should be assumed to be understood until it is clearly reflected from the mind of the learner. Many a time have I been applied to to give the area of circles, the calculation of heating surface, the calculation of power, of safety valves, of grades, etc., thus showing that even in these elementary subjects there was a want, and a disposition to acquire some reliable knowledge of the steam engine.

Take the calculation of the area of a circle, for instance. How many engineers can perform it without consulting an arithmetic, or a table of areas? There are some, of course, but as far as I know they are not numerous. Yet this very operation is the first step in obtaining the power of an engine. The pressure on a piston, a safety valve, or a pump valve; the first in obtaining the capacity of a boiler, of a steam pipe, or of a pump; the first in finding the opening of a smoke stack, the strength of a piston rod, a shaft or a valve stem; the weight of a car wheel, cylinder, piston, axle, or other circular object, or one in which the circular form is found. How useful is the rule, how simple also, but how little known by those who might have occasion to use it oftenest.

The rule is not in itself difficult to acquire or remember, but it is difficult to fix in the minds of machinists and engineers the number of applications of which it is susceptible in their every day business, and the consequent convenience and value of acquiring and remembering it. I will give it here, prefacing it by some remarks on the principles on which it depends.

If a square be drawn closely around a circle, the square having the same length on each side as the diameter of the circle, it is evident that, let the diameter be what it may, the area of a circle will always be in a fixed *proportion* to that of the circumscribed square. The reason is as follows: The square, having always an area in proportion to the square of its length of side, the circle being supposed to be made up of an infinite number of triangles, the area of these together must be increased or diminished in proportion to the area of the figure in which they are drawn. If, then, we can ascertain the *proportion* that exists between the circle and the square of equal diameter, we can easily obtain the area of any circle by obtaining first, that of its circumscribed square. By calculating the area of minute triangles drawn within a circle, its entire area may be approximated. It having been found by a close calculation, that this area was the nearest to .7854 ten thousandths (.7854) of that of the circumscribed squares this number forms the only one to be remembered to enable us to find the area of any circle.

RULE.—Square the diameter of any circle by multiplying the diameter by itself—the product multiplied by .7854, with four places pointed from the right hand of the new product for decimals, will express the area in square feet, or square inches, or in whatever term of measurement the diameter was taken.

Example.—Required, the area of a 12-inch circle: 12 times 12=144, which multiplied by .7854 is 113.0976 inches, or about 113 1-10 inches.

Example.—What is the pressure on a 3-inch safety-valve, the pressure per square inch being shown by the spring balance to be 110 lbs.? 3 times 3 are 9, which multiplied by .7854 gives 7.0686 square inches. This multiplied by 110 lbs. per inch, gives 777.5460 lbs., or about 777½ lbs., as the whole pressure on the valve.

RULE.—The area of the end of a cylinder multiplied by its length, gives its solid contents. There are 1,728 cubic inches in a cubic foot.

What is the bulk of steam admitted to a 16-inch cylinder, at each stroke of 20 inches? The area of a 16-inch cylinder, will be found to be 201.062 square inches. This, divided by 1,728, equals 2,327, or nearly 2⅓ cubic feet. The contents of a pump, or of a cylindrical boiler may be found in the same manner. F.

—Colonel T. A. Scott, of the Pennsylvania Railroad, it is reported, says that the Erie & Pittsburgh Canal will positively be operated during the coming season. The Pennsylvania Central has resolved to give it a fair trial, and if found profitable for the company, business thereon will be continued indefinitely, otherwise it will be closed.

—Messrs. Simons & Co., of Glasgow, Scotland, are constructing iron dredging machines for America. They recently launched a dredge-boat of 400 tons, with 50 horse power engines and a capacity to raise 3,000 tons per day.

The Action of Steam in the Cylinders of Locomotives.

BY FRED. J. SLADE.

[Continued from Page 533.]

The considerations we have already adduced show clearly the value of high speed in any engine, but especially in those which are to be worked expansively. Unless the steam be positively superheated, there will always be a certain quantity of water existing in the cylinder. Now the longer the duration of the stroke, the greater length of time will be afforded for the evaporation of this water, and the greater will be the quantity of heat abstracted from the cylinder for the purpose. In a slow-working, expansive engine, therefore, the cylinder will become materially cooled by the time the piston has reached the end of its stroke, and is ready for a fresh influx of steam, and a large proportion of this will therefore be instantly condensed to restore the cylinder to its previous temperature, this alternate cooling and reheating being repeated at every stroke. If each stroke occupied but an infinitely short interval of time, no water could be evaporated, and therefore no steam would be condensed to supply the heat necessary for that purpose. We see, therefore, that to gain the full benefit of expansive working we must have a great number of revolutions per minute, and we might be led to expect, therefore, that engines with small drivers would work more economically in respect of consumption of fuel than those with large ones.

In an engine cutting off early in the stroke, the ends of the cylinder, which alone come in contact with steam of the boiler pressure, must acquire a higher temperature than those parts which come in contact only with steam which has been expanded, and which consequently has a lower temperature. Re-evaporation must commence from more highly heated parts at a higher pressure than from those situated later in the stroke, and it is quite possible that the water deposited near the end of the cylinder, where the steam is first admitted, should be in process of evaporation while condensation is still taking place on portions less highly heated. These opposite effects, neutralizing each other, evidence of them will be given in the indicator diagram by an expansion line agreeing for a time with the theoretical curve of expansion. This would appear to be the proper interpretation of this very common indication, since we can hardly assume that the temperature of the cylinder throughout is such as to produce neither condensation nor evaporation with the falling pressure of the steam. As the pressure continues to fall, the quantity of water converted into steam becomes greater than the quantity of steam condensed, and if the degree of expansion is considerable, this latter effect ceases altogether.

The third cause of condensation enumerated is inherent in the very act of expansion, and can only be prevented by superheating the steam. The condensation due to the work done while the steam is entering the cylinder, and the pressure in equilibrium with that in the boiler, cannot be said to take place in the cylinder, since, in reality, the work is not done there. We may look upon the column of steam in the cylinder and and steam pipe, which follows the motion of the piston, merely as a means of transmitting to the piston the effect of an expansion that really takes place in the boiler. This column itself undergoes no change, and therefore cannot suffer condensation. But after the valve has cut off the communication with the boiler, all the work done is at the expense of the heat contained in the steam already admitted to the cylinder. The amount of condensation produced in this manner admits of ready calculation when we have the data furnished by an indicator diagram, and, to render this operation more clear, we will take an example. Suppose, in a cylinder 16 in. in diameter, we have the steam cut off when the total volume is equal to 8 in. of the length of the cylinder, the pressure at that instant being 110 lbs. per square inch. Suppose the piston has 16 in. further to travel before the opening of the exhaust, and that the average pressure during that time, as measured on the diagram, is 54 lbs. per square inch, or 69 lbs. above a vacuum. This pressure, multiplied by the area of the piston, 201 square inches, and by the distance moved through, 1⅓ ft., gives 18,492 foot-pounds of work performed by the steam. This, divided by Joule's equivalent, 772, gives 23.95, the number of units of heat which will be abstracted in its production. The weight of steam contained in the cylinder is 0.264 lbs., and the lbs., or 125 lbs. above a vacuum, over that which it contains after expansion, when its pressure above a vacuum is 41.7 lbs. per square inch, excess of its total heat at the initial pressure of 110 amounts to 5.54 units of heat (the difference for 1 lb. weight of steam being 21 units of heat). This is to be deducted from the 23.95 units required to be supplied, and there, therefore, remain 18.4 units of heat to be supplied by the condensation of the steam. This will rob .0199 lb. of steam of the final pressure (41.7 lbs.) of its latent heat, or 7.54 per cent. of the whole amount contained in the cylinder, and the pressure will accordingly be reduced in the same proportion, so that the final pressure will fall 3.1 lbs. below that theoretically due to such a degree of expansion.

This method of calculating the loss of pressure due to the work done, may, however, be considerably simplified, since it is evident that the fall of pressure is independent of the actual weight of steam contained in the cylinder, as the greater the size of the cylinder the greater will be the work done, while, at the same time, the greater in the same proportion will be the weight of steam from which the heat necessary to produce this amount of work is to be drawn, and hence the reduction of pressure will depend solely upon the pressure of the steam and the ratio of expansion. The gain of pressure due to the difference of total heat is also independent of the volume of steam, and dependent solely upon the range of pressure through which the steam is expanded. By calculating, therefore, the number of units of heat required by 1 lb. of steam in expanding n fold, and dividing by the number of units of latent heat contained in 1 lb. of steam of the final pressure, we have the proportion of the whole quantity which will undergo condensation for that degree of expansion, and this, multiplied by the final pressure, will give the reduction of pressure. Calling N the number of units of heat required by 1 lb. of steam in expanding n fold, the loss of pressure by condensation would be expressed by: Final pressure × N × reciprocal of units of latent heat of steam of final pressure.

The gain from the difference of total heat would be found by dividing the difference of total heat of 1 lb. steam of the initial and final pressures, as given in ordinary steam tables, by the number of units of latent heat in 1 lb. of steam of the latent pressure, and this, multiplied by the final pressure, would give the gain in pounds per square inch. Combining this with the formula just given for the loss due to the work done, and we have, (N—difference of total heat in 1 lb. of steam of initial and final pressures) × reciprocal of units of latent heat in 1 lb. of steam of the final pressure × final pressure above a vacuum = the number of pounds by which the steam pressure at the end of the stroke will be reduced by the condensation due to the conversion of heat into the work done by the steam in its expansion. This loss is a consequence of the laws of work and the properties of steam, and hence will occur under whatever circumstances expansion may be performed.

To render this simple formula easy of application in practice, we give, in the following table, the values of N for various ratios of expansion, from 1.1 fold to 7 fold, and also the reciprocals of the numbers of units of latent heat in 1 lb. of steam for pressures ranging from 15 lbs. to 100 lbs. above a vacuum:

Ratio of Expansion.	Value of N.	Total Pressure.	Reciprocal of Latent Heat.
1.1	7 68	15	.00104
1.2	14.7	20	.00105
1.3	21.2	25	.00106
1.4	27.2	30	.00106
1.5	32.7	35	.00107
1.6	37.8		
1.7	42.9	40	.00108
1.8	47.4		
1.9	51.9	45	.00108
2.0	56	50	.00109
2.25	65.6	55	.00109
2.50	74.5	60	.00110
2.75	81.8	65	.00110
3.0	88.9	70	.00111
3.5	101	75	.00111
4.0	113	80	.00112
4.5	122	85	.00112
5.0	130	90	.00112
6.0	145	95	.0113
7.0	157	100	.00113

By means of this formula the calculation for the case, which we supposed above, would be performed as follows:

The ratio of expansion being 3, N will be 88.9; the difference of total heat between steam of the initial pressure of 125 above a vacuum, and the final pressure of 41.7 lbs. is 21 units, and we have,

$$(88.9-21)\times.00108\times41.7=3.1;$$

3.1 lbs. will, therefore, be the loss of pressure at the end of the stroke due to this cause, as found by the previous calculation.—*Engineering.*

[To be Continued.]

The Pennsylvania Railroad Shops at West Philadelphia.

BY JOSEPH M. WILSON, C. E.

[Principal Assistant Engineeer, Construction Department, Pennsylvania Railroad.]

[Continued from Page 493.]

Locomotive and Machine Shop.—This building, numbered 2 on plate i., is a rectangle in form, being 280 feet 1½ inches long by 82 feet 8 inches wide, outside dimensions of brick wall, and furnishing a floor area of 21,840 square feet. Plate iv. is a plane showing the arrangement of tracks, positions of doors, windows, machinery, etc. Plate v. shows an end elevation and section. Plate vi. gives details. Plate vii. is a section through engine and boiler rooms, and plate viii. gives elevation, section and details of stack.

There are tracks for eleven locomotives, each provided with a pit. The details of construction of the walls of the building, and also of the pits, are the same as in the locomotive house. The outer foundation walls are 2 feet 6 inches thick, and all inner walls 2 feet. The outer wall finishes off 4 inches below the surface of the ground, and has a belting course on top of cut stone, 9 inches by 15 inches section. All of the doors have cut stone sills 12 inches deep, and where the tracks run through, the rails are cut into the stone, as in the locomotive house, so as to give a flush surface on top. Above the belting course the walls are of brick, built in panels, with pilasters inside and out, and ornamental cornice outside, as shown in plates. Air passages are built in the foundation walls at frequent intervals, to allow of ventilation under the flooring. These are built up to the surface of ground on outside, and are covered with a cast iron grate, flush with the ground line. Fig. 2, plate vi., shows details of wall with this ventilating passage, and also gives a section through the sewer, showing arrangement for surface drainage. The area between the front of the building and the transfer table is paved with brick. Sewers extend all around the building, and surface drainage is provided between the tracks, and at all necessary points. The pits and the roofs also drain into the sewers. The large doors at the entrance tracks are 11 feet by 15 feet 10½ inches clear opening, and have elliptical heads, the distance from floor to springing line of arch being 12 feet, and the rise of arch to crown 3 feet 10½ inches. These doors are made in two thicknesses of 1¾ inches each, the central portion being glazed. Some of these doors have wickets and some are without. Those with wickets are glazed 2 lights high by 4 lights wide, 13-inch by 20-inch glass and those without wickets 4 lights high by 4 lights wide, of same size glass. The upper elliptical segments and the lower portions of the doors are paneled and molded on the outside, and sheeted diagonally on back with tongued, grooved and beaded stuff. These doors all open out, and are hung on heavy cast iron hinge blocks, built into the brick work, three wrought hinges to each door, and they are provided with the same furniture as those in the locomotive house.

In each gable end of the building is an elliptical headed door opening, 8 feet wide, 8 feet 8 inches in height from floor to springing line, and 2 feet 6 inches rise of arch from springing line to crown. The doors are square at the top being provided with transom and 5-inch impost, and are 2 inches thick, paneled and molded on front, and sheeted diagonally on back with narrow 1-inch tongued, grooved and beaded boards. They are hung on cast iron hinge blocks, two wrought iron hinges to each door. The outside door to boiler room is in one piece, and raises vertically, being hung by chains and weights on pulleys.

The windows in gable ends of the building are semi-circular headed. Those in the sides are square headed. All have box frames, and cast iron outside sills, and the square headed windows have cast iron outside lintels and inside lintel plates. The sash are in two flights, of 12 lights each, 12-inch by 15-inch glass, and are double hung with cord, weights and axle pulleys. In each gable end is a circular window, 4 feet 6 inches, opening in brickwork, with one sash, made to swing in center of height. The floor joist are 3-inch by 12-inch, white pine, laid 1 foot apart, center to center. The wall plates and track stringers are of white oak. The flooring is double, and the details in regard to this, the arrangement of track stringers, and the finish around pits, are all the same as previously described in the case of the locomotive house.

The wall plates on top of brick wall are of white oak, in two thicknesses of 3 by 12 inches each, laid to break joint and well pinned together. Plate v. shows the construction of the roof truss. The principals are placed 10 feet 6 inches from center to center. The principal rafter is of one piece, 10 by 12 inches section, and the tie beam of three pieces, 3½ by 12 inches each, securely framed together with keys, clamps and combination bolts. The number and sizes of the vertical rods are given on the plate, and the notation reads thus, for instance: 2 rods 1½ inch diameter each, with 1½ inch screw at each end. The ends of the rod are upset, so that the effective section of screw shall be the same as that of the rod. The sizes of the braces are also given on the plate. Where the braces cross, one is cut, the parts being kept in proper position by dowel pins. The angle blocks are of cast iron, of the forms and dimensions shown in fig. 3, plate vi. The blocks are numbered, and the numbers, as marked on the elevation of roof, show their several positions in the truss. Tubes are provided for the rods where they pass through the timber to prevent the compression of the wood. The purlins are 4½ by 8 inches section, placed 3 feet apart and securely spiked to the principals, at intervals, by ⅝-inch wrought spikes. The ventilator, the details of which are shown on plate v., and fig. 1, plate vi., runs to within one panel of each gable end of the building. The sides of the ventilator have glazed sash, hung to swing on center, as shown. By a simple arrangement the sash are so connected together in sets that by means of a rope they may be readily opened and shut from the floor below, quite a number of sash at one time. The roof sheeting is of white pine 1-inch boards, brought to a surface and worked. The slate is of the best quality, from the Lehigh quarries of Pennsylvania, and of size 10 by 20 inches, laid to weather 8½ inches.

The gutters, valleys, and eave-pipes are of copper, gauge No. 24. The eave-pipes run down into the sewers, and are protected by a cast-iron guard near the ground. The building is warmed by cast-iron stoves, chimneys being built into the side walls at intervals.

The following is a list of the machinery in the building, numbered to correspond with the plan, plate iv.:

No. 1. Crane. Capacity, 2 tons.
" 2. Wheel-boring Machine. Wm. Sellers & Co., makers.
" 3. Hydraulic Wheel Press. Wm. Sellers & Co., makers.
" 4. Wheel Lathe. Wm. Sellers & Co., makers.
" 5. Crane. Capacity, 5 tons.
" 6. Drill Press. Center of spindle to post, 12 inches; vertical movement of table, 18 inches; hand feeding. Bement & Dougherty, makers.
" 7. Drill Press. Center of spindle to post, 18 inches; vertical movement of table, 34 inches; hand feeding. Wm. Sellers & Co., makers.
" 8. Grindstone.
" 9. Slottiny Machine. From tool to upright, 22 inches; length of stroke, 15 inches; feed motion; circular and horizontal. William Sellers & Co., makers.
" 10. Slide Lathe. Length of shears, 10 feet 3 inches; swing, 20 inches; back geared; screw cutting. Bement & Dougherty, makers.
" 11. Nut Facing Machine. Bement & Dougherty, makers.
" 12. Shaping Machine. Length of shears, 13 feet 1 inch; length of stroke, 12½ inches; double head; feed motion; horizontal, vertical and circular. Wm. Sellers & Co., makers.
" 13. Set-Screw Machine. Bement & Dougherty, makers.
" 14. Slide Lathe. Length of shears, 14 feet 10 inches; swing, 30 inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 15. Slide Lathe. Length of shears, 12 feet 6 inches; swing, 25½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.

No. 16. Slide Lathe. Length of shears, 14 feet 3 inches; swing, 25½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 17. Slide Lathe. Length of shears, 12 feet 6 inches; swing, 20½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 18. Slide Lathe. Length of shears, 12 feet 6 inches; swing, 20½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 19. Shaping Machine. Length of shears, 44 inches; length of stroke, 9 inches; single head; feed motion; horizontal, vertical and circular. Wm. Sellers & Co., makers.
" 20. Slide Lathe. Length of shears, 16 feet 10 inches; swing, 44 inches; back geared. Bancroft & Sellers, makers.
" 21. Cotter Drill. Center of spindle to frame, 15 inches; movement of head, 30 inches; vertical movement of table, 18 inches: self-feeding. Wm. Sellers & Co., makers.
" 22. Drill Press. Center of spindle to post, 20 inches; vertical movement of table, 18 inches; self-feeding and geared. Bement & Dougherty, makers.
" 23. Slide Lathe. Length of shears, 13 feet; swing, 20 inches; back geared; screw cutting. Bement & Dougherty, makers.
" 24. Slide Lathe. Length of shears, 10 feet; swing, 20½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 25. Slide Lathe. Length of shears, 8 feet; swing, 16½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 26. Slide Lathe. Length of shears, 8 feet; swing, 16½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 27. Slotting Machine. From tool to upright, 14 inches; length of stroke, 10 inches; feed motion; circular and horizontal. Wm. Sellers & Co., makers.
" 28. Horizontal Drill and Boring Mill combined. Table, 48 inches by 23 inches, with 18-inch vertical movement; movement of spindle, 24 inches; double rest; self-feeding. Wm. Sellers & Co., makers.
" 29. Hand Lathe. Length of shears, 12 feet 4 inches; swing, 16½ inches. Wm. Sellers & Co., makers.
" 30. Slide Lathe. Length of shears, 7 feet 10 inches; swing, 12½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 31. Slide Lathe. Length of shears, 7 feet 10 inches; swing, 12½ inches; back geared; screw cutting. Wm. Sellers & Co., makers.
" 32. Planing Machine. Length of shears, 4 feet 7 inches; length of carriage, 3 feet 10 inches; width of post, 19 inches; height of post, 18 inches; Wm. Sellers & Co., makers.
" 33. Drill Dress. Center of spindle to post, 18 inches; vertical movement of table, 34 inches; hand feeding. Wm. Sellers & Co., makers.
" 34. Planing Machine. Length of shears, 22 feet 4 inches; length of carriage, 14 feet 7 inches; width of post, 36 inches; height of post, 36 inches. Wm. Sellers & Co., makers.
" 35 Hand Lathe. Length of shears, 5 feet; swing, 14 inches. Fox Patent.
" 36. Planing Machine. Length of shears, 6 feet 6 inches; length of carriage, 5 feet 4 inches; width of post, 19 inches; height of post, 18 inches. Wm. Sellers & Co., makers.
" 37. Planing Machine. Dimensions, same as No. 36. Wm. Sellers & Co., makers.
" 38. Planing Machine. Length of shears, 15 feet 8 inches; length of carriage, 10 feet 6 inches; width of post, 25 inches; height of post, 24 inches. Wm. Sellers & Co. makers.
" 39. Drill Press. Center of spindle to post, 22½ inches; vertical movement of table, 24 inches; self-feeding and geared. Wm. Sellers & Co., makers.
" 40. Grindstone.
" 41. Two Screw-Cutting Machines. Wm. Sellers & Co., makers.
" 42. Slide Lathe. Length of shears, 9 feet; swing, 16 inches; back geared; screw cutting. Bement & Dougherty, makers.
" 43. Slide Lathe. Length of shears, 10 feet; swing, 20½ inches; back geared; screw cutting. Bement & Dougherty, makers.
" 44. Drill Press. Overhead. For drilling tires; hand feeding. Bement & Dougherty, makers.
" 45. Milling Machine. Length of carriage, 42 inches; raise of cutter, 4 inches; index plate and centers attached. Wm. Sellers & Co., makers.

Nos. 44 and 45 have been accidentally omitted on the plate. No. 44 is located between No. 42 and the track running lengthwise in the building. No. 45 is between No. 1 and the gable end wall.

It is intended occupying the space beyond No. 41 with some new machinery not yet purchased.

Between the tracks, as at *b*, *b*, etc., and along the walls at *a*, *a*, *d*, *d*, *c*, *c*, etc., are located work-benches. Each bench has a drawer and closet attached, both being furnished with lock and key, numbered to correspond with a number on the closet. Each workman, therefore, has his own bench, with a closet in which to keep his hat, coat, overalls, etc., and a drawer for his tools, all under his own control.

Plate vii. shows a section through the engine and boiler rooms. The engine was rebuilt from an old one constructed by Samuel. V. Merrick & Sons, some years ago, and in use by the company before the building of this shop. It is about 90 horse power, diameter of cylinder 16 inches, length of stroke 40 inches, and is provided with a Huntoon governor, but otherwise does not merit attention. The diameter of band wheels is 12 feet.

The boiler was built at Altoona, Penn., railroad shops. It is of ⅜-inch boiler plate, of the form known as locomotive boiler. What was originally the fire-box is now used as a combustion chamber, a self-feeding furnace of brick, lined with fire-brick, being built in front, as shown on plate. The fuel used is the refuse of anthracite coal, and is piled up over the furnace in the part *a*, from which it feeds down through a series of small square section openings, *b*, *b*, arranged 4½ inches apart, the whole length of the furnace. The fireman, in poking the fire, by running his poker along under the openings, back and forth, can easily regulate the admission of fuel as needed. The boiler is provided with a pair of Richardson's safety valves, a gauge of the Cleveland Gauge Company, registering to 200 pounds, and is fed by an injector.

At *f* a steam pipe goes off to blacksmith shop, to supply steam to hammers. At *g* a steam pipe connects with the engine. The smoke-box of boiler connects, by a passage, *e*, *e*, with the stack. (See plate viii.) In this passage, where it runs under the wall of the building, is a slide valve, raised and lowered by means of a winch and chain, to regulate the draft. It usually requires to be kept open about 10 inches. The arrangement of furnace appears to work very satisfactory.

The stack is of brick, with a cut-stone base and cast-iron cap, and has a total height of 121 feet 8 inches, the inner diameter of flue being 4 feet. The section is an eight-pointed star, the points of the star being built hollow, with openings to the outer air at bottom and top. There is an inner lining of one brick thick, 4½ inches, not bonded in with the rest of the work, which, as far up as *a*, *a*, is of fire brick, but above that, of ordinary hard brick. The cap is cast in sections and bolted together.

[NOTE.—There are several important improvements we could suggest in this building, especially in the construction of the roof truss, which is faulty in several respects, but as we propose at the conclusion of these articles giving a general review, and taking up questions of this kind, we will not, therefore, consider them here.]—*Journal of the Franklin Institute.*

[To be Continued.]

Old and New Routes for Commerce.

That the old channels of commerce are not easily disturbed and turned aside from their course is a fact attested by all history. Yet it seems as if we were on the eve of a great revolution in the course of the vast trade which is carried on with China, India and Japan. The suggestive announcement was made by telegraph yesterday that the steamship Great Republic had just landed at San Francisco with 5,700 packages of tea to be sent by railroad to Chicago, 1,140 packages for Boston, with 1,000 packages of tea and a large quantity of silk for New York. This is but one of a multitude of indications of the revolution to which we have referred and of the rapidity with which new bonds of commercial union between the Orient and this country are developing by means of the Pacific railroads. The monopoly so long enjoyed by the old great routes for the rich commerce between Asia and Europe is disputed. Several new routes are attracting commerce from its ancient currents, and disturbing their settled flow. The enlightened policy of this country is obviously to multiply by all possible means the forces which will attract over the route across this continent the vast Oriental trade that has so greatly enriched every section through whose territory it has ever heretofore passed.

It is not a little singular that on the day of the arrival of the Great Republic at San Francisco, the contract of the government with the Pacific railroads was up in Congress. The difficulty between Mr. Boutwell and the companies can scarcely fail to embarrass the railroad people, and the whole subject is now fully referred to the Judiciary Committee of the Senate, who, it is hoped, will report without delay. The merits of this controversy are well understood by the public, and need not receive more than a brief recapitulation. It is well known that Mr. Boutwell insists on interpreting the law so as to compel the railroads to repay promptly in cash the interest on their subsidy bonds. This demand, they reply, is not in the law as heretofore interpreted. For the last six years, the understanding has been acted upon, both by the Treasury and the companies, that the government should be reimbursed for this interest, not in cash, but in services. And it is claimed that the provision in the law of 1864 appropriating one-half of all monies earned for such services, was made with the mutual expectation that the extent of the government business would be such that, before the expiration of the thirty years' lifetime of the subsidy bonds, the whole amount due would thus be paid. But in any case the government agreed to forbear until the maturity of the bonds, all demands for any other payment than such as might arise from the half of the earnings of the road for the transmission of mails and military supplies, and for other government services. The argument, as we understand it, is as follows, in support of these positions: First, the companies say that at the time the contract was made between them and the government, a military road across the continent was a strategic necessity. We were in the midst of the darkest gloom of our civil war; foreign intervention was threatened; the Pacific States were supposed to be, if not disaffected, at least in danger; the troops we could spare for service on the plains were not enough for the protection of our vast interior territory without a railroad to increase our power of mobilizing and concentrating our armies on any given point. The military situation required the road to be built with unexampled rapidity. To secure this rapid construction when gold was wildly fluctuating at 200 or above, and when iron and other requisites had to be sent around Cape Horn, when the freight of a single locomotive cost $6,000, when insurance was at war rates, amounting to as much as 17½ per cent., and when rails cost $140 a ton, involved such risks that the most adventurous of our engineers and financial potentates shrunk from the undertaking as certain to bring ruin on whoever put their money into it. It was then an almost impossible task to raise funds amid the universal disrepute and disfavor with which the enterprise was at first greeted in Wall street.

Secondly. The companies say that in view of these facts the government decided that the road must be built, and entered into a contract with them running over thirty years, at the close of which period all government moneys advanced to the company were expected to be repaid with interest. On these conditions subsidy bonds were donated to the company to an amount equal to about one-fourth of the expense of equipping and building the road. The government was also to have control of the new route at all times for military purposes, and over it were to be sent all the military stores and mails transported between the Missouri and the Pacific coast.

Thirdly, the companies say that the military stores have been sent by sea and otherwise, either from routine of caprice or negligence, and still that the low rates for freight have already caused a saving to the government of four or five millions a year. They add that if the whole of the government business were allowed to pass by this route, that the half earnings prescribed in the law would pay, speedily, all that Mr. Boutwell demands. And they claim that this ought to be done, because their tariff of rates is as low as that of other routes, and because, having completed their road six years earlier than was required by law, they equipped it at vast expense, and with a special view to affording all needful facilities to the government without interfering with the business traffic of the line.

Fourthly, it is urged that the express terms of the law of 1864 deny to Mr. Boutwell the right to withhold, as he has done, the whole of the moneys earned by the railroads, and that he is bound by the terms of the law to pay one-half in cash. This is the only argument of the railroad companies which the Treasury has yet answered. Mr. Attorney-General Ackerman's argument on this point was briefly reviewed in the *Chronicle* some time ago. He leaves wholly out of view the fact that a contract has been made between the companies and the government; that this contract must be faithfully performed; that the faith of the government is pledged to it; that the road has been built in reliance upon it, and that the development of the Pacific Railroad is essential to the commerce and other material interests of the country. In illustration of this last point we are told that, but for the economies introduced by the Pacific Railroad, our production of gold and silver would have fallen off 25 per cent., and we should have lost to that extent the immense advantages in regard to the balance of trade and to the adjustment of our foreign exchanges, which are confirmed by our large annual production of the precious metals. Moreover, it is officially reported that, in the last five years, 1,184 miles of railroad have been constructed in the State of California alone During the current year, 500 miles more are expected to be opened there, and it is not easy to see how rapidly the resources of the Pacific slope will develop as they receive the quickened stimulus of the new streams of European commerce with the Orient, as they flow across our territory, enriching and paying tribute to it in their course.—*Commercial and Financial Chronicle, Feb.* 18.

Transferring Land Grants.

Attorney-General Akerman, in response to a request from the Secretary of the Interior, has given the following opinion with reference to the rights of the Oregon Central Railroad & Telegraph Company to assign its lands, franchises and privileges to the Willamette Valley Railroad Company, whose agent, Ben Halliday, had bought the same for $1. Mr. Akerman, in his opinion recently rendered, says that, except the first section, no part of the act suggests even the suspicion that Congress, when it passed the law, supposed that, under any circumstances, it was to deal with any other company than the one to whom the charter was granted, and there is no promise in the bill for any transfer of the rights, privileges, or lands granted. The Attorney-General then enumerates some of the reasons why such a provision should not have been put into the bill. The law not only grants privileges, etc., but it also requires something to be performed by the company. If this company should disappear, the question arises, could any other company be forced to perform these stipulations. Again, if a transfer may be made at all, then portions of the road may be transferred to different companies and individuals, and so the government would be forced to deal with several, perhaps, irresponsible companies, instead of with one responsible one. As to the expression in the first section, "their successors and assigns," the Attorney-General holds that it is only a form of expression, and grants no rights not expressly given in the bill. It is noticeable that the contract by which the transfer was in this case made, does not contain any agreement on the part of the Willamette Valley Company to issue bonds and execute mortgages, etc., as the Oregon Railroad was required to, but only to build a railroad and telegraph line. The opinion closes with the following remark: "I have not entered into the general question of the rights of a corporation to transfer its franchise without special authority from the Legislature," etc.

—Among the bills which failed to pass in the Forty-first Congress, for want of time, were the act to prevent cruelty to animals transported by railroad, and the act to charter the Cincinnati Southern Railroad Company.

—The Camden & Amboy Company has for once been defeated in the New Jersey Legislature by the passage of a bill which authorizes the construction of a short road which will complete what is known as the "Air-Line" railroad across the State.

General Railroad News.

RAILROAD LAW.

[Under this head there will be given, hereafter, in these columns, a careful digest of recent American and English decisions in cases affecting railroad property or the business of transportation, prepared by a competent lawyer. It is intended to state the points decided so clearly and concisely that the agents and other employes of companies may clearly comprehend and easily remember them.]

Negligence—Measure of Damages is Pecuniary Loss—Exact Pecuniary Loss need not be Shown.

The Supreme Court of Pennsylvania, in the case of *Penna. R. R. Co. vs. Keller*, has recently decided a doubtful point in the new railroad statute of that State of 1868, relative to the measure of damages in cases of negligence. The following is an abstract of the leading points of the opinion delivered on February 9, 1871.

The material point in the case was this: "That any "recovery must be strictly limited to a pecuniary com- "pensation for a loss actually shown to have resulted "from the negligence of the defendant." The language of the statute to be construed was as follows:

"In all actions now or hereafter instituted against common carriers or corporations, owning, operating, or using a railroad as a public highway, whereon steam or other motive power is used, to recover for loss or damage sustained, and arising either from personal injuries or loss of life, and for which, by law, such carrier or corporation could be held responsible, only such compensation for loss or damage shall be recovered as the evidence shall clearly prove to have been pecuniarily suffered or sustained, not exceeding, in case of personal injury, the sum of three thousand dollars, nor in any case of loss of life, the sum of five thousand dollars."—*Annual Digest by Brightly*, 1521.

The company contended for a construction which would limit the measure of damages to such *actual damages as the evidence shall clearly prove to have been pecuniarily suffered or sustained*, excluding any prospective, consequential damages. The court declares this view utterly unreasonable, holds that life in a certain sense is property, and that the standard measure of its worth is its pecuniary value, which is to be determined by the jury. The general principles as laid down by the Supreme Court of the United States in *Railroad Co. v. Bonen*, 5 Wal. U. S. Sup. Ct. Rep. 90—a case which went up from Illinois—is fully endorsed as the law of the measure of damages in negligence cases in Pennsylvania. The plaintiff need not show the precise amount in dollars and cents. This the jury shall determine after evidence of some pecuniary loss is shown.

Leases of Connecting Railroads in Pennsylvania—Construction of the Act of April 23, 1861—It means Unfinished Roads.

The Pennsylvania Legislature of 1861 passed an act on this subject in these words:

"That it shall and may be lawful for any railroad company created by and existing under the laws of this commonwealth, from time to time to purchase and hold the stock and bonds, or either, of any other railroad company or companies chartered by, or of which the road or roads is or are authorized to extend into this commonwealth; and it shall be lawful for any railroad companies to enter into contracts for the use or lease of any other railroads, upon such terms as may be agreed upon with the company or companies owning the same, and to run, use and operate such road or roads in accordance with such contract or lease: *Provided*, That the roads of the companies so contracting or leasing shall be directly, or by means of intervening railroads, connected with each other."

It has been urged by parties interested that this law can apply only to *finished* roads, and a decision by the highest court to that effect would of course annul all leases of unfinished roads heretofore made, and disable them in future. In the case of *Wood, Morell & Co. vs. The Bedford & Bridgeport Railroad Company*, it has just been decided in the Western District of Pennsylvania that this act, on the contrary, has special reference to *unfinished* roads, inasmuch as it confers no rights as to finished roads which did not already exist. The argument mainly is that it was not the intention of the Legislature to enable large corporations to absorb the finished lines of smaller corporations, by controlling the stock and management, but to enable organized capital to finish weak roads through rich districts so as materially to develop the State. The argument that a railroad is not a "connecting road" within the intent of the statute until it is finished is characterized as "an "artificial and stiff-backed mode of interpretation," and it is declared that the purpose of the act was not "to "cram the maws of overgrown trunk lines with spoils "drawn from communities which have been able to help "themselves by building their own lines," but rather to enable "powerful corporations to favor the poorer "companies, by means of their capital and enterprise, "under contracts for the use of their lines when "finished, such as will protect the interests of both "parties."

Negligence—Duties of Parents—Rule of Damages—Infantile Responsibility.

In the late case of *O'Flaherty vs. The Union Railroad Co.*, besides affirming the general principles heretofore applicable in such cases for damages, the Supreme Court of Missouri takes a very decided and lenient position with respect to the responsibilities of parents and infants.

The court holds that it is not negligence in parents to permit a child two years and a half of age to go upon the street attended only by its sister, a child of eight years, and says: "Although the sister was but eight "years old, she might have been entirely adequate to "afford it protection under ordinary circumstances. It "is the only attendance many people are capable of "affording their children. To say that it is negligence "to permit a child to go out to play unless it is ac- "companied by a grown attendant, would be to hold "that free air and exercise should only be enjoyed by "the wealthy, who are able to employ such attendants, "and would amount to a denial of these blessings to "the poor."

Duty of Railroad Companies in Constructing Works—Liability for Negligence—No Liability for Culvert Broken by Extraordinary Floods.

The facts in the late important case of the *Pittsburgh, Fort Wayne & Chicago Railway Company vs. Gilleland*, and *Same vs. McClinton*, are mainly these:

The action is founded upon the duty of a railroad company to construct its works with proper skill and care, and with a due regard to the features of the ground over which its road passes, and was for an injury caused by the continuance, after notice, of an insufficient culvert so unskillfully and negligently constructed by the former proprietors of the railroad as not to vent all the water that flows down the channel over which it is built, in the ordinary seasons of high water.

The court finds that in all its strictness the old law maxim, *sic utere tuo ut alienum non lædas*, that a railroad may not lawfully use its own premises to the injury of the privileges of others; that the company exercises a part of the public right, "but the State, as "*parens patriæ*, is always careful to her children, doing "no unnecessary hurt, and, in delegating this power to "a private company of men, she does not intend that "they shall be less careful of the interests of her peo- "ple than herself."

The general principle is adopted that the company is bound to bring to their execution the engineering knowledge and skill ordinarily known and practiced in the construction of such works.

In the above cases judgement was reversed for error, and, on the main question, it was decided:

"In the present case, then, if the culvert was so unskillfully and negligently constructed as to be insufficient to vent the ordinary high water of the stream, the railroad company building it would have been liable for the injury thereby caused. The apparent facts indicated the duty. The stream, though small, must find a vent, or overflow the adjacent land and undermine the railroad. Its size, the character of its channel, and the declivity of the circumjacent territory which forms the water-shed, indicated the probable amount of water to be passed through. Proper engineering skill should observe these circumstances, and supply the means of avoiding the injury which would result from locking up the natural flow, or obstructing its passage so as to cause a reflux in times of ordinary high water. Beyond this, prudent circumspection cannot be expected to look, and there is, therefore, no liability of extraordinary floods, those unexpected visitations, whose comings are not foreshadowed by the usual course of nature, and must be laid to the account of Providence, whose dealings, though they may afflict, wrong no one. If, then, there were an original wrong in the construction of the culvert, and a nuisance created thereby, the present owners of the road would be responsible for its continuance after notice."

The Law of Damages when Servants of Companies are Injured through the Negligence of Co-employes—The General Rule—The Exception in Ohio.

The decision in the recent case of the *Pittsburgh, Fort Wayne & Chicago Railway Co vs. Devinney* (17 Ohio, 197) affirms the limitation which the courts and Legislature of Ohio have hitherto made with respect to this subject. This cause presented the question whether, in the absence of any evidence that the railroad company had knowingly or negligently employed an incompetent conductor or engineer for the train, through the faulty running of which the collision occurred, the company is, in law, responsible for an injury received by a brakeman of one train, in consequence of the negligence or mismanagement of the conductor or engineer of another train of the same company?

The general principle of law upon this question was ably summarized by Judge Read, in delivering the opinion of the Supreme Court of Pennsylvania, in *Caldwell vs. Brown*, 6 Am. L. Register N. S., 752:

"A servant, by entering into his master's service, assumes all the risks of that service which the master cannot control, including those arising from the negligence of his fellow servants. In case of an injury to one servant by the negligence of another, it is immaterial whether he who causes and he who sustain the injury are or are not engaged in the same or similar labor, or in positions of equal grade or authority. If they are acting together, under one master, in carrying out a common object, they are fellow servants. The master, indeed, is bound to use ordinary care in providing suitable structures, engines, tools and apparatus, and in selecting proper servants, and is liable to other servants in the same employment if they are injured by his own neglect of duty. But it makes no difference whether the master is an individual or a corporation; in either case he is responsible to his servants for his own negligence, but not for that of their fellow servant."

To this general doctrine an exception has been taken in Ohio, which is thus defined: "that where one servant is placed in a position of subordination to, and subject to the orders and control of another servant of a common master, and the subordinate servant, without fault of his own, and while in the performance of his duty, is injured through the negligence of the superior servant, while acting in the common service, an action lies in favor of the inferior servant so injured against the master."

This divergence given the general law the court declare themselves, in this case, unwilling to increase, affirming that they are not responsible for the reasoning upon which former decisions, establishing this limitation, are based. As to the general principle, they explain the rule in Ohio in the following explicit language:

"Employers are not omniscient, and if they were they would hardly be able to find employes whose vigilance was incapable of relaxation, and whose carefulness would never lapse into negligence. It is therefore unreasonable to expect such results from employers of ordinary penetration and insight into character, and wrong to exact it from them. And if it be a crime, or *quasi* crime, as some who argue the question of the masters responsibility seem unconsciously to intimate, to put in operation the tremendous and dangerous enginery and natural forces which modern civilzation has discovered, invented and applied, it is surely a sufficient answer to a claim of responsibility on that ground against the employer, on the part of the employe, to say that the latter is a voluntary *particeps criminis*. And in the consideration of questions arising under the law regulating the rights and obligations of master and servant, it is important that we should not forget that the same rules which we apply as against railways and other rich and powerful corporations, must also be applied with equal hand to private employers of labor in analogous cases.

The true general rule is, and so it must be, that when men are employed for the prosecution of a lawful but hazardous business, they assume the hazards of such employment arising from the negligence of co-employers, and stipulate for compensation according to their estimate of such hazards; subject, however, to this exception, that the master is liable for such injuries as accrued to the servant from the negligence of a fellow servant in the selection of whom the master has been culpably negligent; and to this we in Ohio have added the further exception of a case where the servant injured is subordinate to, and acting under the orders of, the culpable fellow servant."

TRAFFIC AND EARNINGS.

The following is a report of the earnings of the Great Western Railroad of Canada for the week ending February 2, 1871:

Passengers	$20,890 87
Freight and Live Stock	68,434 25
Mails and Sundries	2,145 14
Total Receipts for week	$19,470 26
Corresponding week, 1869	75,983 59
Increase (20 per cent.)	$15,486 67

—The annual report of the South Carolina Railroad Company shows that the comparative earnings for the past two years were:

Total earnings, 1870	$1,472,02 ' 59
Total earnings, 1869	1,382,167 00
Increase	$89,853 59

As compared with 1869 the expenses are:

1870	$916,095 82
1869	909,405 43
Increase	$6,690 39

The ratio of expenses to earnings for 1870 is 62 23-100 per cent.; for 1869 is 65 79-100 per cent.

The increase in freight earnings is 14 per cent., and in freight tonnage 28½ per cent., showing an average reduction in rates during the year of 11¼ per cent. The decrease in passenger earnings is 10 per cent., and

the increase in number of passengers carried 35 per cent, both partly due to the reduction of fares in November, 1869, from five to four cents per mile.

MECHANICS AND ENGINEERING.

Exportation of British Rails.

Messrs. Heyerdhal, Schoenberg & Co., of No. 32 Pine street, New York, makes the following statement of the exports of railroad iron from Great Britain for the month ending January 31:

	1869. Tons.	1870. Tons.	1871. Tons.
Spain and Canaries	531	2,430	881
Austrian Territories	3,741	5,00	82
Egypt	....	502	....
United States	20,421	24,610	28,264
Spanish West India Islands	319	521	15
Brazil	18	165	1,783
Peru	2,275	750	217
Chili	617	2,664	233
British North America	116	....	100
India	1,672	21,070	4,455
Australia	1,712	1,149	1,118
Russia	....	908	193
Sweden	....	....	....
Germany	494	2,610	28
Holland	812	1,441	....
France	1,032	41	....
Other Countries	2,677	4,791	3,133
Total	36,430	68,652	40,502

Thus it seems that there has been a steady increase of exportations to this country, though the total exportations this year were but about four-sevenths of the exportations of the previous year.

Car Ventilation.

A correspondent writing from Wyandotte, Kansas, referring to our articles on ventilation, speaks of the danger of opening windows of cars for the sake of ventilation, not only on account of the draft of cold air, but of accidents from falling windows, which are not uncommon and often serious, as in a case which our correspondent witnessed, when a little child had its hand so shattered by the falling of a window which its mother had raised that amputation was necessary. Our correspondent commends as a very satisfactory system that now used on the Kansas Pacific Railway, which a Mr. Gerhardt has invented and claims a patent. This system is not described fully enough to be intelligible, but the writer says that it provides both for the admission of pure air and the removal of foul air. When the patent has been issued we hope to be able to give a description of this invention.

Loading Wood and Coal on Tenders.

There is now building at Logansport, Indiana, an improved apparatus for depositing upon the tender of a locomotive a full load of wood or coal so quickly and accurately that no stopping of the locomotive is necessary. It consists of a large frame, spanning the track, 24 feet wide, by 20 feet high, with a rack, into which the wood or coal is loaded, suspended by a rope attached at one upper corner of the frame, and passing down through a pulley at the rack and up over a windlass at the other upper corner of the frame. As the locomotive advances slowly under the frame it catches, by a simple device, a stirrup which is so connected as to draw up the rack and swing it over the tender, when the operator, standing upon the ground, can unkey the rack and allow all its contents to fall out. Mr. Jesse Nicholson, of Monticello, Indiana, the patentee, is superintending the construction of the machine.

Steam on Canals.

In view of the recent accidents in England, it is proposed to separate as much as possible passenger and freight traffic on crowded lines. A correspondent of the Manchester *Courier* proposes to remove the freight to the canals to be operated by steam. He says:

"How strange it seems, that while steam has been applied to almost every other operation, it has not yet been brought into use effectually on inland water carriage; and yet it is actually at this moment successfully used on many canals, though they are not made for it, and in many respects are unfitted for it. But if a canal were constructed or altered, so as to make it really suited for steam, the goods could be carried at ample speeds, and at a cost which is impossible on land. Even without steam several lines of canals are carrying from a million to a million and a quarter tons a year, with the expense of animal draught, of extremely small boats, and of endless delays from the imperfection of the locks, and this in the midst of railways with all the power of steam at their back. The actual cost of transit with steam, including all items excepting the profits, on the canal, with small boats on short trips, is at this moment about 1-10th of a penny a ton per mile, even on these unsuitable lines. Were the locks sufficiently long to admit boats of two or three hundred tons burden, and provided with sluices to fill and empty in less than a minute, the cost of transit in distances of one or two hundred miles certainly would not be more than 1-20th of a penny a ton per mile, and the charge for interest, etc., on a capital of £15,000 per mile, at seven per cent., for a million tons, would be only a farthing a ton, and the traffic on all the principal lines would be far above a million tons, so that a total charge of a farthing a ton would be ample, and at this low charge the traffic would increase far beyond anything we now see, for it depends wholly upon the cost, and if that is diminished it may expand to any extent."

Probably none of the English canals have such a traffic as the Erie Canal has in this country, but we see the railroads are every year invading its field and transporting the heavy and cheap goods which demand the lowest rates, and are not at all in a hurry. Steam, however, may change all this, but it seems hard to adapt it to narrow and shallow canals.

Elevated Pneumatic Railroad.

Dr. R. H. Gilbert gives, in the New York *Herald*, the following description of the elevated pneumatic road which he proposes to construct in Broadway:

"The plan is to place along the street, at distances of from 50 to 100 feet, compound Gothic iron arches, which shall span the street from curb to curb, at such an elevation as shall not interfere with the ordinary uses of the street. The bases of these arches will be strongly anchored beneath the curb-stones in blocks of granite. The gaslights will be supported on the ornamental columns, which take the place of the lamp posts, and the telegraph wires will be carried on the arches, so that the streets may be relieved of much which now encumber them. The arches are strongly connected with each other by means of a vertical, latticed or trussed girder running between the tubular ways, which are to be firmly joined to it on either side by ties of suitable construction. Through the tubes, supported as described, cars carrying passengers are to be propelled by atmospheric power. There is also provision in the same set of arches for two or more sets of tubes for the transportation of mails and packages.

"The office of these compound wrought-iron arches is to support a series of longitudinal tubes, to be constructed of wood or other suitable material, over the middle of the street, in such a way as not to intefere with the ordinary uses of the street or with the light of the buildings along the line of the road. By this system there will be no disturbance or interference with the water, sewerage or gas-pipes of the city, nor will travel be obstructed while the road is being built, which can be all done outside the city, and be ready to put up in a year's time from the commencement.

"The stations will be situated at distances of about one mile apart along the line, and will be provided with pneumatic elevators to raise passenggrs to and from the place of transit with perfect safety, thus obviating the necessity of going up and down stairs for transit.

"The movement of the cars or trains along the line, as well as their arrival and departure from stations, is made known at all points by the telegraphic device which is automatically operated by the cars in passing, so that they are at all times under control, thereby securing absolute safety to passengers and property.

"At the several stations there will, also, in addition to the motive power, be located reservoirs containing compressed air, to be used when additional power is necessary for starting or stopping heavy trains. By means of connecting pipes these reservoirs will communicate with each other, so that the power stored up therein when taken from one, may be almost instantly supplied by another. Thus power may be stored by engines when not otherwise engaged, and transmitted long distances, rendering it not only possible, but economical to make use of the waste power of manufactories, or water power located long distances away or behind the city limits."

Dr. Gilbert claims as the great advantages of such a road, freedom, greater speed than is possible otherwise, the most perfect safety from fire, collisions, and running off the track, entire freedom from obstruction by ice and snow, cheapness and quickness of construction, capacity for transporting freight, greater capacity (on account of great speed), noiselessness, comfort, freedom from danger and breakage incident to the use of a heavy locomotive, ability to surmount steep grades, and the advantage common to elevated roads, that it absolutely adds to the street capacity, by leaving the street entirely open for traffic.

OLD AND NEW ROADS.

Burlington, Cedar Rapids & Minnesota.

Negotiations of the company with Blue Earth City have reached such a stage that the *Post* of that city feels authorized to announce that the line will at once be located from the present terminus at Cedar Falls to Blue Earth City, and the grading completed this season—if the Blue Earth citizens fulfill their part of the contract.

Lafayette, Bloomington & Mississippi.

President Gridley, on the occasion of his resignation last week, made the following statements of the present condition of the company's work:

"The road bed is now completed from near the Illinois Central Railroad at Bloomington, to the Indiana State line, as are also the bridges, culverts and cattle guards. In fact, the entire line of road from Bloomington to the Indiana State line is completed ready for laying the ties and iron. And from the State line to Lafayette the road is graded, and the stone piers for the bridge across the Wabash River at Lafayette are completed and ready for the timbers to complete the bridge. From half a million to a million of dollars has been expended upon the entire line of road from Bloomington to Lafayette, and the road should now be finished at the earliest possible day during the coming summer, and no effort in that direction should be spared."

Northern Transportation Company.

The change in management of this company, spoken of in these columns some weeks since, has been lately made. Mr. Chamberlain, President of the company has sold his entire interest, for $600,000, to Ex-Governor Smith, President of the Vermont Central Railway, to be paid in monthly installments of $85,000. Mr. Chamberlain will remain in charge of the line until the amount agreed upon in the terms of the purchase is fully paid. The present equipment of the company consists of twenty steamers, all stanch, well-appointed vessels; and it is understood to be the intention of the new management to establish a tri-weekly service between Duluth and either Detroit or Cleveland. At whichever of these points is finally agreed upon as the eastern terminus of the line, through freights will be re-shipped to Ogdensburg. Meanwhile the lines to Chicago, Milwaukee, Toledo, Buffalo, and Cleveland will be maintained very much as heretofore.

Gilman, Clinton & Springfield.

Tracklaying has been commenced at Gilman, and is progressing rapidly towards Springfield. Five or six miles are completed, and it is intended to complete the work by the 1st of July.

Hannibal & St. Joseph.

Mr. Edward Wilder, the Land Commissioner, reports that the sales of this company's railroad lands in North Missouri, for the month of February were, to 28 purchasers, 1,241.90 acres, and 2 town lots, for $14,924.26, or an average of $12.02 per acre.

Cedar Rapids, McGregor & Milwaukee.

On the 14th inst., a company was organized under this name, in Cedar Rapids, Iowa, with a capital of $3,000,000. The articles of incorporation were adopted, and a preliminary survey provided for. Stock books were opened and $50,000 taken at once. A board of fourteen directors were elected, from which the following officers were chosen: H. G. Angle, President; S. C. Bever, Vice-President; Dr. J. T. Ely, Treasurer; W. J. Abernethy, Secretary.

Sabula, Ackley & Dakota.

The Dubuque (Iowa) *Times* says: "If it be true that the Sabula, Ackley & Dakota Railroad has obtained the means to build the road to Marion, then we are to witness, the coming summer, the astonishing spectacle, hitherto unknown in the State, of two rival railroad companies building parallel lines of road for more than eighty miles into the interior, at an average distance from each other of only three miles."

The parallel road referred to is the Iowa Midland, which the Northwestern supports, while the Milwaukee & St. Paul aid the other. If both are built, it is safe to say that neither will be a good property.

Camden & Atlantic.

The company operate 60 miles of road from Camden southeast to Atlantic City, New Jersey. The annual report, lately presented, gives the receipts, expenses, profits, and percentages of profit, as follows:

	Earnings.	Expenses.	Profits.	Per cent.
1865	$266,848 32	$178,310 01	$88,498 31	66.83
1866	288,649 95	149,394 54	139,255 41	51.75
1867	306,972 03	149,920 73	157,045 30	48.84
1868	325,040 84	174,945 74	150,095 10	53.82
1869	320,677 65	174,690 02	136,057 63	54.45
1870	333,514 87	167,083 29	166,431 58	50.09

The report says: "If not deceived by present appearances, the way business will increase more rapidly in the future than it has in the past, as there are evidences of a growing disposition to establish manufactories on the line of the road."

Up to 1866 no renewals were required. From that time to the present there has been expended on this account, as follows:

Roadway	$76,615 96
Engines	10,140 39
Freight cars	7,766 50

The increase of the rolling stock since 1855 has been as follows:

Engines	$69,595 51
Passenger cars	75,378 95
Freight cars	16,153 33
Total	$161,127 79

The report concludes thus: "This growth in the business, together with the continual economical working of the road, is a subject for congratulation to the stockholders, and justifies the belief that the

"company has passed through its days of darkness and "depression, and is now rapidly approaching the period "when it will take its place among the dividend-paying "roads of the country."

The earnings, it will be seen, are at the rate of about $5,500 per mile. The through business is chiefly the transportation of passengers to the sea-shore in summer, and the country on the line is thinly settled and not productive.

Northern Pacific.

The track is now laid to the Mississippi at Brainerd, 94 miles from the junction with the Lake Superior & Mississippi Railroad, at Thomson, and 118 miles from Duluth. The grading is completed for 60 miles west of the Mississippi, which brings the line literally "out of the wilderness," as the remainder of the line, or most of it, will pass through the very beautiful and fertile country in the valley of the Red River of the North. The iron is to be put down as fast as possible, on the part of the line graded, and it will soon be completed.

Mahoning Coal Railroad.

This Ohio company has lately been organized. The proposed road is to extend from Youngstown, Mahoning County—half-way between Cleveland and Pittsburgh—north to a point in Brookfield Township, in Trumbull County, the road to be all within the limits of Mahoning and Trumbull counties. The capital stock is $70,000. The corporators are Joseph H. Brown, William Bonnell, Richard Brown, Augustus B. Cornell, and David Himrod.

New Orleans, Mobile & Chattanooga.

A bill has been introduced into the Louisiana Legislature authorizing the Governor to subscribe, for the State, for $2,500,000 of the company's stock, which subscription is to be paid for in bonds of the State drawing eight per cent. per annum interest ($200,000), and is to be taken by the company in lieu of the $12,500 bonds it was to have received under its charter for every mile of road constructed.

Peoria & Rock Island.

This road is now completed to Wyoming, Stark County, where it crosses the Buda & Rushville Branch of the Chicago, Burlington & Quincy Railroad. Timber has been delivered at Wyoming for the construction of the bridge over the Spoon River, about two miles from that place, and it is believed that the road will be completed to that point by the 1st of April, and to Galva by the 1st of May.

Peoria, Atlanta & Decatur.

Prescott & Co., the contractors, have been making contracts for piles and bridge timbers, and the people on the line are encouraged to believe that the work will soon be resumed in earnest. Only ten or twelve miles remain to be graded between Peoria and Atlanta.

Michigan Railroad Consolidation.

The Ohio & Michigan Railway Company and the Mansfield, Coldwater & Lake Michigan Railway Company have entered into an agreement to consolidate into a single corporation, to be known as the Mansfield, Coldwater & Lake Michigan Railroad Company. The stockholders of the first named company will meet at Coldwater on May 9th to vote on the question.

Mount Pleasant & Bradford.

This road, 9 miles long, from Bradford, on the Connellsville Railroad, two miles west of Connellsville, northwest to Mount Pleasant, Pa., has been lately completed and opened for business.

New Jersey Central.

The New York *Bulletin* says: "A bill has passed the New Jersey Senate authorizing the construction of a railroad from Flemington, the present terminus of the south branch of the New Jersey Central, to the Delaware River, where a connection will be formed with the road now building from Philadelphia to that point. The road proposed is a branch of the New Jersey Central. It is proposed to cross the Delaware River somewhere in the neighborhood of Bull's Island, and as it is fourteen miles from Flemington to the river, the object is to build a branch on the Pennsylvania side of the Delaware, to connect with the North Pennsylvanian Railroad; and thus the two largest cities in the Union would have another direct communication."

Flint & Pere Marquette.

One of the last acts of the last Congress was to pass a bill to extend the time for the reversion to the United States of lands granted by Congress to the State of Michigan for a railroad from Pere Marquette to Flint.

Indianapolis, Cincinnati & Lafayette.

Mr. W. T. Boaz resigned the position of Receiver of this company last week, sending with his resignation a petition setting forth that the greater portion of the stock of the company—two-thirds or more—is owned by citizens of the States of Massachusetts, New York, and Rhode Island; that the greater portion of the bonded indebtedness of the company is owned by citizens of these States, and the States of Pennsylvania and Connecticut; that a large amount of the floating debt of the company is also owned and held by citizens of these States; that, for the purpose of obtaining future necessary loans, and the management of the trust, that these Eastern interests should be in harmony with the receivership. These Eastern stockholders make it as a preliminary condition to their lending money that they shall be represented in the receivership.

Mr. Boaz' resignation was accepted, and Mr. Melville E. Ingalls was appointed Receiver in his place.

Maine Central and the Belfast & Moosehead Lake.

Negotiations for the lease of the last-named road to the Maine Central Company were entered into at a late conference of the two directories, but no arrangement was effected. The New York *Bulletin* learns that the Maine Central directors proposed:

"1. To equip and run the road for four years, paying all the net earnings to the other company, and at the expiration of the term to take a lease and pay a rent equal to the largest net earnings for any one of the four years, or to equip and run the road and pay 50 per cent. of the gross earnings for three years, and 40 per cent. for forty-seven years.

"2. To take a lease for fifty years of the Belfast & Moosehead Lake Railroad, *in its present condition*, and pay a rent of $24,000 a year for the first five years, $28,000 for the next five years, $32,000 for the next five years, $36,000 for the next five years, $40,000 for the next five years, and $42,000 for the next twenty-five years, or to pay $35,000 a year for fifty years."

It was a condition of all the propositions that the rate of fare and freight to and from Belfast should be no higher than to and from Bangor for similar distances.

Houston Tap & Brazoria.

This railroad was sold for taxes by the State of Texas on the 15th ult., and the State of Texas became the purchaser, for $89,000.

Springfield, Cincinnati & Dayton Short Line.

The stockholders, at a meeting on the 7th inst., ratified the contract with the Cleveland, Columbus, Cincinnati & Indianapolis and Lake Shore & Michigan Southern railways, and the Cincinnati, Sandusky & Cleveland Railroad. The surveys will soon be in progress at both ends of the line.

Burlington & Southwestern.

The Fort Madison (Iowa) *Democrat* says: "It seems that we have been misinformed in regard to the progress that has been made in the construction of the Burlington & Southwestern Railroad. We were laboring under the impression that the grading had been completed as far as Farmington, and so stated to the public, but we have been informed from a reliable source that the heaviest portion of the grading between this city and that point is yet to be done. Under the present circumstances, it is not likely that the road will be ready for business before June or July, and then not beyond the town of Farmington."

Chesapeake & Ohio.

Even before it has completed its first line, this company has conceived a great "system" of railroads, for which a bill has been introduced into the Virginia Legislature. This authorizes a loop line from a point near Covington, which, by the present route, is 205 miles from Richmond, down the James River to Richmond. Such a line would be from 20 to 70 miles from the present line, and would be even longer than the latter, which is itself quite indirect. It would pretty evenly divide the territory between the present line of the Chesapeake & Ohio and the South Side Railroad. The great advantage claimed for it is low grades, as by it there would be no grades of more than 30 feet to the mile to overcome, going eastward from the Ohio to Richmond. Another branch authorized by this bill is one from a point not west of Staunton, northeastward to the Potomac, above Washington, about 125 miles. This would be, in large part at least, a Shenandoah Valley line, of which there is likely to be enough if this company, the Pennsylvania, and the Baltimore & Ohio carry out their plans. Authority is also given for an extension or extensions eastward from Richmond to a seaport, either on James River, York River, or Chesapeake Bay.

MISCELLANEOUS.

—The Common Council of Cincinnati have appointed a committee to memorialize the Ohio Legislature "to propose an amendment to the State Constitution which will permit municipal corporations, under proper restrictions, to aid in the construction of railroads as they may deem necessary to their future prosperity, by subscriptions to their stock or donations, as they may deem best."

—A resolution has been offered in the New York Legislature requiring the owners of sleeping and palace cars to report the names and the number of the stockholders, the amount of shares of stock held by each, the number of such cars, the cost of each, the amount received for their use during the year 1870, the number of passengers carried, the average distance traveled by such passengers and other like information.

—John H. B. Latrobe read a paper before the Maryland Historical Society, at its recent meeting, on "A Lost Chapter in the History of Steam-boats," in which he sought to show that Robert Fulton was not the inventor of the steam-boat.

—A contract has just been signed by Mr. Vogel, Postmaster General of New Zealand, with Wm. H. Webb and Benj. Holladay, of New York, for running a line of mail steamers every four weeks between San Francisco, New Zealand, Sydney and Melbourne. The contract provides for large ships, and of a speed to enable the mails between Sydney and London to be delivered in forty-eight days. The pioneer ship is to sail from San Francisco on the 18th of April. The mail contract by Hall's line ends this month.

—The commissioners appointed some months ago to condemn property in St. Louis for an approach to the bridge building there, have completed their labors. The property condemned embraces fifty-four feet from the levee to Third street, and the widening of Third street between Washington avenue and Green street. The amount awarded to the owners, exclusive of several lots bought by the bridge company at private sales, is $287,493.

—The Grand Jury of the Court of Oyer and Terminer in New York last week reported that their attention had been called by the report of the recent New Hamburg disaster to the state of the laws regulating the running of trains, and they recommend "that the "Legislature now in session enact a law, under severe "penalties, requiring every railroad train, whether "passenger or freight, to come to a full stop within "two hundred feet of, and before entering upon any "bridge having a draw, or any other bridge having a "span of more than one hundred and fifty feet, fully "believing that the enforcement of such a requirement "would have prevented the late collision at New Ham-"burg, and that its enactment and enforcement will "make it impossible for such another accident to "occur." As the accident was not caused by an open bridge, and as the bridge was not open, and as the accident might have occurred where there was no bridge, the Grand Jury perhaps would have provided a more comprehensive and safer scheme if they had recommended that the law should require every train to come to a full stop before crossing *any* point on the road.

PERSONAL.

—General Gridley, who has been President of the Lafayette, Bloomington & Mississippi Railroad Company since its organization, has resigned his office, and the resignation has been accepted to take effect when his successor shall be elected.

—R. P. Morgan, Jr., late Chief Engineer of the Lafayette, Bloomington & Mississippi Railway, has resigned.

LOCOMOTIVE STATISTICS.

Louisville, Cincinnati & Lexington.

Mr. John Skidmore, Master Mechanic of the company, reports as follows the cost per mile of running locomotives on this line for the last six months of 1870:

Repairs ordinary	2.99	
" due to accidents	.69	
		3.68
Engineering and firing		7.29
Watching and cleaning		.99
Fuel		10.09
Oil and waste		1.02
Water supply		.85
Total		23.92

The report is for 201 miles of road operated.

ELECTIONS AND APPOINTMENTS.

—At a meeting of the Cleveland, Columbus, Cincinnati & Indianapolis Railway Company, at Cleveland, on the 1st of this month, the following directors were elected: L. M. Hubby, Samuel Williamson, William Collins, John Miller, George Worthington, Horace F. Clark, H. B. Hurlbut, Selah Chamberlain, T. P. Handy, J. W. Burson, Amasa Stone, Jr., Augustus Schell, Oscar Townsend. The only changes from last year are Horace F. Clark and Augustus Schell, of New York, in place of J. H. Wade and Stillman Witt, of Cleveland. At a subsequent meeting of the directors all the officers were re-elected for the ensuing year, as follows: President, Oscar Townsend; Vice-President, H. B. Hurlbut; Secretary and Treasurer, George H. Russell; General Superintendent, E. S. Flint; Chief Engineer,

Frank Ford; General Freight Agent, Lucien Hills; General Passenger Agent, E. A. Ford; General Ticket Agent, S. F. Pierson; Auditor, A. Ely; Paymaster, S. B. Jackson; Master Mechanic, L. S. Young; Master Car Builder, W. F. Smith; Division Superintendent Indianapolis Division, C. C. Gale; Division Superintendent Columbus Division and Springfield Branch, Robert Beel.

REGISTER OF EARNINGS.

FOR THE MONTH OF FEBRUARY.

Michigan Central (284 miles), 1871	$404,008 11
" " (284 miles), 1870	329,127 57
Increase (22¾ per cent.)	$74,880 54
Chicago & Alton (465 miles), 1871	$340,301 26
" " (431 miles), 1870	316,036 92
Increase (7⅝ per cent.)	$24,264 34

FOR JANUARY AND FEBRUARY.

Chicago & Alton (465 miles), 1871	$693,536 69
" " (431 miles), 1870	597,145 82
Increase (16 per cent.)	$96,390 87

Chicago Railroad News.

Railway Employes' Mutual Benefit Association of the West.

The annual meeting of this association will be held at the Tremont House at 11 o'clock a. m. on Tuesday next. The association was organized a year ago, on a plan similar to that of the Conductors' Insurance Company, and other like organizations, and addresses itself to the employes of all Western roads and transportation lines *not* engaged in the running department. The membership has grown in this first year to more than nine hundred, and this has been effected at an outlay of less than $900, including the Secretary's salary. But one of the members died during the year, and the loss was promptly paid, as, by the system adopted, a balance is kept in the treasury sufficient to pay one loss without waiting for the collection of the assessment.

Chicago Rock Island & Pacific.

The movement of westward-bound freight over this line opens early and quite heavy, owing, probably, to the early spring. The Chicago & Southwestern Railway (which the Chicago & Rock Island Company operates under a lease) has just been opened to Centreville, Appanoose County, Iowa. This branch leaves the Chicago, Rock Island & Pacific main line at Wilton Junction, Iowa, and passes through Muscatine, Washington, and Centerville, Iowa; Trenton, Gallatin, and Cameron, Mo., to Leavenworth, Kansas. It is expected that trains will run into Leavenworth next October. The line runs through the great stock country of Northern Missouri.

Below are the freight rates, which took effect March 10:

Distance from Chicago.	STATIONS.	MERCHANDISE. 1st class.	2d class.	3d class.	4th class.	Wheat, per 100 lbs., per car-load	Salt, stucco, cement, 24 brls. and over	Soft lumber, per m.	Cattle and hogs, per car	Household goods, agricultural implements, in carloads	Coal, iron, stone, etc., 10 tons
271	Brighton	83	71	60	50	30	78	$9.50	$60.00	$76.00	$56.00
276	Fairfield	85	72	60	50	30	80	9.50	60.00	78.00	60.00
279	Acheson	85	72	60	50	30	80	9.50	60.00	78.00	60.00
293	Libertyville	88	75	62	50	30	85	9.50	60.00	78.00	60.00
303	Ashland	90	75	63	50	30	85	9.75	60.00	78.00	60.00
310	Floris	90	75	63	50	32	90	9.75	62.00	82.00	62.00
317	Belknap	93	78	66	53	33	90	10.00	64.00	86.00	66.00
321	Drakeville	95	80	68	55	34	95	10.00	66.00	90.00	70.00
333	Unionville	100	85	73	58	35	95	10.25	68.00	94.00	74.00
345	Centreville	105	90	78	63	37	100	10.50	70.00	98.00	78.00

Other stations will be opened as the road is extended.

The Chicago, Rock Island & Pacific has three cargoes of railroad iron on its docks, belonging to the Chicago & Southwestern, and is forwarding six or seven cars daily.

Michigan Central.

The company commenced running their through freight trains over the air line, from Niles to Jackson, last Sunday. Passenger business is considerably increasing. The earnings of the main line for the month of February, show an increase of 22¾ per cent. over the same period last year.

Chicago & Alton.

The receipts for the month of February were $340,301, which is $24,264, or about 7 per cent. more than in February, 1870. For the months of January and February the earnings were $693,536.69 in 1871, and $597,145.82 in 1870, an increase of $96,390.87, or about 16 per cent.

—Some English railroad companies seem to have souls enough to be not only grateful but generous. For instance, at a late meeting of the Lancashire & Yorkshire Railway Company a proposal to grant the sum o. £5,000 to the widow of the late Chairman of the company, Mr. George Wilson, was adopted by an almost unanimous vote. This is as if the Chicago & Northwestern Company had given $25,000 to the widow of Henry Keep.

—The traffic receipts of the Great Western of Canada for the week ending February 10 amounted to £18,795, against £15,613 in the corresponding week of last year, showing an increase of £3,182, or 20 per cent.

Kansas Pacific Railway Report.

The following business summary and financial statement of the Kansas Pacific Railway Company for the year ending December 31, 1870, has been issued by the President, John D. Perry, dated at St. Louis, February 20:

The company has been actively engaged, during eight months of the year, in the construction of that portion of its main line known as the "Denver extension." On August 15th, the road was completed between Kansas City, Missouri, and Denver, Colorado, a total distance of 630 6-10 miles. Of this distance, about 210 miles of track were laid in 1870.

The following is a general exhibit of the earnings and expenses of the transportation department for the year 1870:

EARNINGS.

Freight—		
Ordinary	$1,707,586 60	
Government	148,867 49	
Denver extension	385,965 80	
Total		$1,242,419 89
Passenger—		
First-class	$857,020 00	
U. S. troops	95,220 32	
Expresses	52,886 21	
U. S. mails	73,476 32	
Total		$1,078,602 85
Miscellaneous—		
Rents	$ 286 60	
Individuals and companies	33,943 16	
Sundry sources	5,534 71	
Total		$39,763 87
Gross Earnings		$3,360,786 61
Distribution—		
Mdse. and passenger traffic	$2,657,256 68	
Government business	317,564 13	
Denver extension	385,965 80	
Total		$3,360,786 61

EXPENSES.

Conducting transportation	$653,586 04	
Motive power	875,765 65	
Maintenance of cars	220,752 03	
Maintenance of way	592,526 2	
General expenses	137,410 02	
Total expenses		$2,480,040 46
Net proceeds to balance		$880,746 15
The average length of road in operation during the year was	551 50-365 miles.	
And the gross earnings per mile		$6,097 91
In 1869, " " " "		5,075 48
Increase per mile in 1870		$1,022 43
The earnings from merchandise and passenger traffic in 1870, were		$2,657,256 68
The earnings from merchandise and passenger traffic in 1869, were		1,703,415 92
Increase in 1870		$953,840 76

The transportation of live stock has increased largely over any preceding year, and has become an important branch of the business of the road.

Total shipment of live stock in 1870	6,542 car-loads, or	130,840 head
" " " " 1869	2,500 " "	50,000 "
Increase in 1870 (nearly 162 per cent)	4,042 car-loads, or	80,840 head

The live stock driven from Texas have heretofore reached the line of road at points east of Ellsworth, but since the completion of the road to Denver there is every promise of a heavy movement of cattle from Texas, Southern Colorado, and New Mexico, over the whole length of the line.

The operating expenses of the road have been about 73 per cent. of the gross earnings, an increase of 11 per cent. over the preceding year. This increase in expenses has been due to the operation of the new road rapidly extended into an uninhabited country, without any immediate corresponding increase of business; to the large expenditure incurred in providing permanently against winter snows; and to the high rates which the company has been compelled to pay for fuel at the western end of the line. A very large reduction has since been secured in the cost of fuel in Colorado (amounting to a saving of $6 per ton, or about $450 per day), by the completion of the Boulder Valley Branch of the Denver Pacific Railway, direct to one of the best coal mines in the Territory. The control of the Denver Pacific & Boulder Valley roads being in this company, insures their operation in harmony with it.

In view of the completion of the road to Denver, the prospective growth of trade with Colorado and the Pacific coast, the active settlement being made on the lands along and tributary to the road, and the assurance of a cheap and abundant supply of good fuel, we believe that, with economical management, the operating expenses of the road will not hereafter exceed 60 per cent. of the gross earnings. The earnings in 1870 exceeded the estimate made in the annual report, published at the beginning of the year, by over $3 0,000, and we are satisfied that the estimate then made of $4,000,000 of gross earnings for 1871, will be fully realized. We estimate the *net earnings* from the transportation department, for 1871, at $1,600,000.

The total land grant of the company aggregates about 6,000,000 acres of which about 5,300,000 acres were unsold December 31, 1870.

Three million acres, lying between the 380th mile post and Denver, are included in the mortgage for $6,500 000, dated June 20, 1869, known as the "Denver Extension Mortgage," and the remainder of the lands unsold July 1st, 1870, are covered by the land grant mortgage of that date for $2,000,000.

One million five hundred and three thousand five hundred and sixty-five acres of these lands have been appraised and placed in the market, at an average price of $3.10 per acre.

The total sales of lands and lots in 1870, were 124,168 acres for $389,105.68, or an average of $3.13 per acre. Cash collections from land sales during 1870 were $217,520.31, and bills receivable, outstanding December 31, $1,120,905.86.

By the terms of the mortgage of July 1, 1870, the proceeds of all sales of lands made after that date are placed in the hands of the trustees for the purchase and redemption of the bonds issued thereunder. Sales of lots and lands, under this trust, from July 1st to December 31st, aggregate 27,246 acres and 139 town lots, for the gross sum of $111,234.16 of which $41,472.86 was cash and $69,761.30 was bills receivable. The 2,000,000 acres of land covered by this trust, estimating from sales already made, and the appraisements placed upon the unsold tracts, will probably yield to the company, after the payment of the $2,000,000 of bonds issued thereon, a net amount of from $2,000,000 to $2,500,000, which will in time inure to the capital stock. A portion of the 3,000,000 acres of land, chiefly in Colorado, which are included in the mortgage of June 20th, 1869, for $6,500,000 have been appraised and placed in the market, and it is believed that from these lands a sum will ultimately be realized sufficient to take up the bonds long before maturity.*

CAPITAL STOCK AND FUNDED DEBT.

Capital stock authorized by law	$10,000,000 00
Capital stock issued	6,872,500 00

INTEREST-BEARING BONDS.

First Mortgage 26 year Bonds, authorized by Pacific Railroad Acts of Congress, bearing interest at 6 per cent. in gold, payable semi-annually, secured on 393 15-16 miles of main line	$6,303,500 00
First Mortgage 30 year Leavenworth Branch Bonds, bearing 7 per cent. interest in currency, secured on 34 miles of road between Leavenworth and Lawrence.	600,000 00
Land Grant Bonds, bearing 7 per cent. interest in currency, not secured on road but upon 1,000,000 acres of land between 140th and 240th mile posts, ($126,000 maturing March 1st, 1871, balance March 1st, 1876.) outstanding	318,00 00
First Mortgage 30 year Railroad and Land Grant Bonds, dated June 20th, 1869, secured on main line, from 393 15-16 mile post to Denver, at 638 6-10 mile post, and on 3,000,000 acres of land, bearing 7 per cent. interest in gold, free of United States taxes	6,500,900 00
First Mortgage 10 year Land Grant Bonds, secured on all land unsold July 1st, 1870, lying east of 380th mile post, (not less than 2,000,000 acres,) bearing interest at 7 per cent. in gold, free of United States taxes	2,000,000 00
	$15,721,000 00

U. S. GOVERNMENT SUBSIDY BONDS.

Second mortgage on 393 15-16 miles of main line; principal payable in 30 years, in currency, interest 6 per cent. in currency, payable only by retention in the United States Treasury of one-half of charges for government transportation	6,303,000 00

INCOME BONDS.

Principal payable in 50 years, interest 7 per cent. currency, payable from *net earnings* only	4,975,360 00

The railroad and lands owned and controlled by this company, consist of—

Main line, Kansas City to Denver	638 6-10 miles.
Branch, Lawrence to Leavenworth	34 miles.
Total miles of Kansas Pacific Railway	672 6-10 miles.

Controlled by purchase of stock and lease—

Denver Pacific Railway, Denver to Cheyenne	106 miles.
Denver & Boulder Valley Branch	15 miles.
Total miles owned and controlled	793 6-10 miles.

Kansas Pacific Railway lands, unsold (about) 5,300,000 acres.

The assets of the company, in addition to the railway structure and equipments, and the lands, as estimated above, amount to	$4,026,057 05
Liabilities, in addition to the funded debt	1,790,777 23
Excess of assets over liabilities	$2,235,279 82

The assets included in the above statement consist chiefly of $1,058,691 of notes for lands, $111,234 of cash and notes for land sold under a trust deed, $501,000 in the company's own securities, $75,521 of National Land Company stock and notes, $142,241 due for transportation for the United States, $1,500,000 in Denver Pacific shares, and supplies on hand, collections in agents' hands, real estate, etc.

The liabilities include $420,680 due on vouchers and pay rolls, $430,348 bills payable, $582,400 notes given contractors due in 1872, 1873 and 1874, and about $350,000 due on sundry accounts.

*Sales of 5,575 acres of these lands made since January 1, 1871, average $5.76 per acre.

Prices of Rails.

Bigelow & Johnston, of No. 48 Pine street, New York, report as follows the prices of rails for the month ending February 28, 1871:

	Gold.	Currency.	Import, tons.
NEW RAILS.			
English	$55 @ $56		4,600
American		$68 @ $70	
Total import this month			4,600
Import since January 1			10,040
Total to date			14,640
Same time, 1870			
OLD RAILS.			
Double heads	$38½ @ 38¾		
T or flange	38		2,454
U or bridge	Nominal.		
Total import this month			2,454
Import since January 1			4,058
Total to date			6,512
Same time, 1870			7,607

"*New Rails.*—There has been a fair business during the month, but chiefly at low figures. The English market having advanced 5*s.* @ 10*s.* per ton has led to increased quotations here and great firmness on the part of holders.

"*Old Rails.*—The demand has been light and the difficulty of moving goods has caused some sales at very low prices, chiefly in currency. The market abroad is very firm and prices for forward delivery rule a shade above those on spot."

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent.

Removal.—The office of the RAILROAD GAZETTE *is removed to Nos.* 110 *and* 112 *Madison Street.*

☞ *Our Prospectus and Business Notices will be found on the last page.*

THE DARIEN CANAL.

The reported success of Commander Selfridge in his explorations for a practicable route for a ship canal across the Isthmus of Darien has renewed interest in this important work and excited hopes which we cannot but hope may be realized. But we have so often been doomed to disappointment in this matter, that we shall not quickly believe that all difficulties have vanished before Commander Selfridge and his party.

The letter of this officer, dated January 13, which was reported by telegraph from Panama, stated that the height of the dividing ridge was but 300 feet, and the reporter's accompanying telegram stated squarely that the height was just 300 feet; but in a later letter, dated at Aspinwall, February 9, Commander Selfridge says that "he is confident" that the water-shed, where crossed, is not more than 300 feet high, but that he measured only the height of the ridge, and estimated the altitude of the base of the hills above the sea. This, of course, is not very satisfactory.

It seems that the route surveyed at this time connects the Gulf of Darien, on the Atlantic side, with the Gulf of San Miguel, nearly due west of it on the Pacific side. It would do this quite indirectly, through, first, the channel of the River Atrato, which runs nearly due north, and empties into the Gulf of Darien, then the canal west or northwest across the divide to the Tuyra River, which is a branch of the deep Darien River (not to be confounded with the Gulf of Darien, on the Atlantic side) which empties into San Miguel Bay. Thus the route would be from the mouth of the Atrato in the Gulf of Darien nearly due south 39 or 40 miles, thence westward by the canal about 50 miles, as Commander Selfridge gives it (including, doubtless, the long section of the River Tuyra to be made navigable), and thence northwestward 40 miles or more by the channel of Darien River to the Bay of San Miguel.

This is not, for the most part, a new route, for nearly all the surveys of the Ithmus of Darien have included either the River Atrato or the River Darien, or both, and many expeditions have been made, though, doubtless, the explorations in that difficult country have been by no means exhaustive. But Trautwine surveyed quite carefully the valley of the Atrato, searching for a practicable connection with Pacific, and on the best route he could find he estimated the cost of a canal at $325,000,000. Further surveys with the same object were made in 1858 and 1859 by Lieutenant Michler. An old Spanish map prepared in 1781 shows the entire ground, and though doubtless not entirely accurate, indicates that the ground had then been examined and studied with a view to a connection of the two oceans between the Gulf of Darien and the Bay of San Miguel.

The importance of the proposed canal cannot easily be exaggerated. It would shorten the sailing distance from New York to Canton by 8,900 miles, or more than 40 per cent.; the distance to Shanghai by 9,600 miles, or 44 per cent.; to San Francisco 14,000 miles, or 74 per cent., to Australia 2,830 miles, or 28 per cent., to Valparaiso, 8,10 miles, or 63 per cent.; to Calcutta, 4,100 miles, or 18 per cent. It is estimated that a tonnage of more than 3,000,000 tons with a value of $467,000,000 would pass through the canal annually, and that the annual saving to the world by the use of the canal would amount to about $59,000,000, of which the United States would save $36,000,000.

WARMING AND VENTILATION OF RAILROAD CARS.

[Continued from Page 514.]

It is still in dispute whether the human breath as it leaves the body will rise or fall in a calm atmosphere of a temperature of 70°. Some of the best authorities on the subject of ventilation differ in regard to this question. Plans for ventilating houses and railroad cars have been devised on each hypothesis.

A common idea is, that the expired air, being warmer than the surrounding atmosphere, therefore rises. Another is, that the greater specific gravity of the carbonic acid causes it alone, or in combination with the air which has passed through the lungs, to fall. There is no evidence to indicate that the carbonic acid combined with expired air separates from it, unless it remains perfectly calm for a considerable time; and even then it is doubtful whether they separate when once mixed, excepting by absorption. It is therefore not a question whether any one of the products of respiration, but whether the entire expired matter composed of all of them combined with the air as it leaves the lungs is heavier or lighter than the surrounding atmosphere. If the expired air is so light as to rise just as soon as it leaves the lungs, then, of course, it should be exhausted at the top of the room or car; if, on the contrary, it falls, it should be removed at the floor. The difference of opinion which exists in relation to this point has occasioned much dispute and confusion in the science and practice of ventilation. With the knowledge now within our reach, it is impossible to say with certainty which is the true theory. The diversity of opinion which exists in relation to it makes it probable that the difference in the specific gravity of ordinary air at a temperature of 70° and that which is expired is very slight. If it were otherwise no such difference of opinion would probably exist. Ordinary observation with the smoke of a cigar shows that the breath mingled with the smoke moves very slowly, unless impelled by some current of air, and is very soon diffused equally through the whole room, if the air is not perfectly calm. The same is doubtless true of the breath. In railroad cars the motion of the car itself, and the frequent passing to and fro of persons going in and out of the car, will cause a sufficient disturbance of the air to prevent the breath from settling to the floor or rising to the roof. At any rate, a little observation with cigar smoke will show that the expired breath will not move *against* a current of air; therefore, if we can produce a downward motion of the air, *the breath will not rise* but descend. If, on the other hand, the atmosphere in the car moves in an ascending current, *the breath will not fall.*

As a constant supply of air *must be* introduced into a car, and the same quantity be exhausted, a current of some kind must be maintained. If, therefore, we can cause this current to pass through every part of a car, it will be sure to carry with it all the products of respiration and other exhalations from the human body. As the whole car is at times filled with people, if the air in any part of it becomes stagnant it will also become impure. Our problem then is, *how to supply* 1,000 *cubic feet of fresh warmed air per minute and diffuse it equally through the whole car.*

Before considering the means by which this can be done, a little investigation of the laws which control the motion of the air will be necessary.

Warmed air, being lighter than cold, will rise to the top, in any apartment into which it is introduced; or if cold air is brought into a room filled with that which is warm, it will immediately fall to the floor.

If, as an illustration, we take a vessel of any form—say similar to that represented by fig. 1—and fill it with

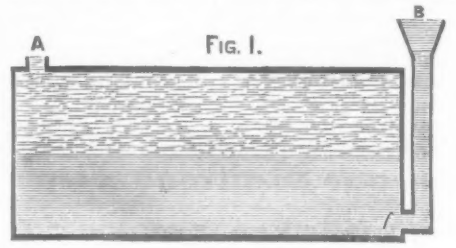


FIG. 1.

water and oil, the oil will float on top of the water, as shown in the engraving, the broken lines representing the oil and the full lines the water. If now we pour more water into the tube *B*, which connects with the bottom of the vessel, then the oil will flow out at *A*, and the water will gradually rise and displace the oil. If, on the other hand, we should pour oil into the vessel (fig. 2) at *C*, then the water would flow out at *D*,* and if

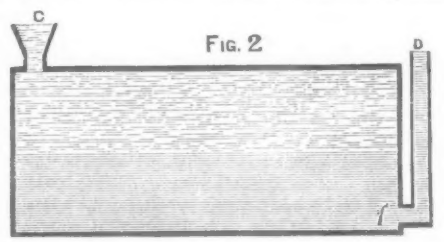


FIG. 2

enough oil is poured in, the water in the vessel will all be displaced by the oil. If we pour oil into the tube *F* (fig. 3), it will at once rise above the water as soon as it enters the vessel and will displace

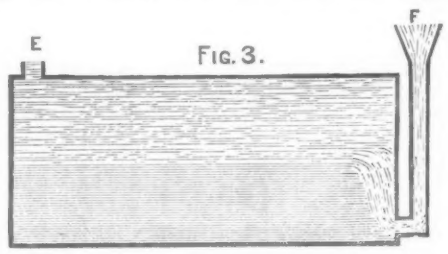


FIG. 3.

a corresponding quantity of oil, which will flow out at *E*. If, instead of pouring water into the tube which connects with the bottom of the vessel, we pour it into the orifice at the top (*G*, fig. 4), it will at once sink to the bottom and cause a quantity of water to flow out at *H*. It will be impossible to make the water flow out

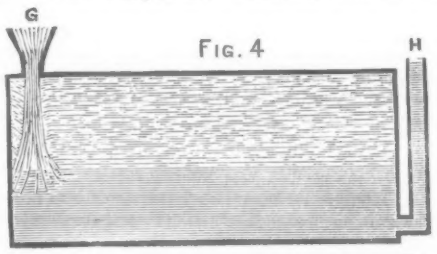


FIG. 4

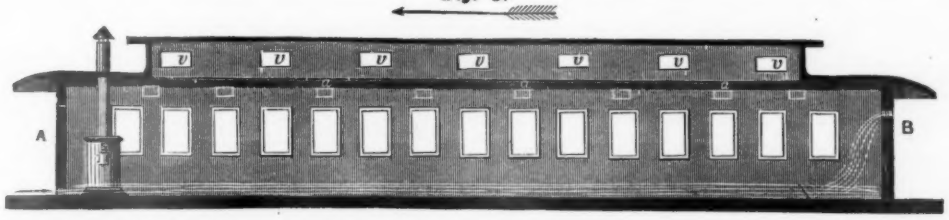
at the top of the vessel so long as there is any oil in it, or make oil pass out through the tube which connects at the bottom while the level of the water is above the opening at *f*, *f*, (figs. 1 and 2.) It will also be equally impossible to keep the water at the top of the vessel or the oil at the bottom. The one will rise to the top just as certainly as a cork will float, and the water will sink to the bottom as surely as a stone will when thrown into a pond.

If instead of water and oil we substitute cold and hot air in the vessels described, we will have almost an exact representation of the relations the latter will bear to each other under the same conditions. The cold air being the heavier will fall to the floor, and the hot air being lighter will rise to the top, just as surely as do the water and oil. If the vessel contains both warm and cold air, then

* The mouth-piece *C* must in this case be sufficiently high that the column of oil it contains will overcome the difference between the specific gravity of the water and oil.

that which escapes from the top will be warm, and that exhausted from the bottom will be cold. No matter where the hot air is introduced, or at what point the cold air is supplied, they will inevitably each find their place, one above and the other below, and they will occupy the same relative position in any apartment, such as an ordinary room or car. Fig. 5 represents a car with an opening under the door *A*. If the train is running in the direction of the dart, the cold air will rush in under the door, and will lie in a cold stratum the whole length of the car, as shown by the white lines. As it enters it will displace the same

Fig. 5.



quantity of air, which will escape by the ventilators, if they are open, or by any other aperture or crevices through which it can pass. If the opening, instead of being at the bottom of the door is at the top, as shown at *B*, then if the train should run the reverse direction to that shown by the dart the cold air will rush in, and as soon as it enters will fall to the floor like a cascade, whose descent will be more or less sudden according to the force with which it is injected into the car. The same effect will take place if the air enters through openings, *a*, *a*, in the sides of the car, where they are often placed. It is true that the stove *S* will gradually warm some of the cold air, which will then rise; but unless the opening which admits the air is closed, there will be a continued supply to maintain the cold stratum on the floor. The following experiments were tried by the writer to learn what the temperature at the roof and floor of a car ordinarily is in cold weather. The first three were tried on the Pittsburgh & Cleveland, the others on the Philadelphia, Wilmington & Baltimore Railroad:

Temperature at roof of car	72°	90°	72°	87	80°
" half way up	65	62	54	..	..
" at floor	53	47	46	58	55
" outside	8	8	8	..	..

The Pittsburgh & Cleveland car in which the experiments were tried had five very powerful exhaust ventilators in the roof, which were so arranged that they could not be closed. The weather the day the last two experiments were tried was ten or twelve degrees warmer than the day those on the Cleveland & Pittsburgh road were made. From personal experience the writer is satisfied that a difference of 50° in the temperature of the air at the bottom and top of cars is not uncommon in cold weather, when they are heated by ordinary stoves. Of course the hot air escapes through the ventilators, *v*, *v*, *v*, when they are open and there is any aperture through which air can enter the car to take the place of that which is exhausted. We, therefore, have the curious anomaly, which is very common, of attempting to heat a car by *admitting cold air* and *exhausting that which is warm*.

[To be Continued.]

The East St. Louis Tornado.

The telegraph informs us of a tornado which passed over East St. Louis on the afternoon of Wednesday last, and caused the destruction of railroad property to a very great amount. It seems that the gale was from the southwest, and, commencing with the river bank, it demolished the principal structures in its path. It first struck the East St. Louis elevator, on the bank of the river, and removed its roof. Here also it blew into the river the derricks and other movable appliances used in the construction of the east pier of the Illinois & St. Louis Bridge. Next in order it struck and totally destroyed the great freight house (800 feet long) of the Vandalia road, and a water-tank 85 feet high. The new freight and passenger houses of the St. Louis & Southeastern Railway, the two large freight houses, a part of the passenger depot and the large round-house of the Chicago & Alton road, the car house, a part of a freight house and two or three offices of the Ohio & Mississippi, the freight and passenger houses of the Toledo, Wabash & Western, and a part of the roof of the Indianapolis & St. Louis road were destroyed. A train of cars, including the locomotive, which weighed 30 tons, were blown off the track into the slough; (?) another train of thirteen cars loaded with grain was overturned; a train running in on the Indianapolis & St. Louis road was overturned when about three miles north of East St. Louis, and a large number of empty cars, standing on a side track nine miles distant, were overturned.

The round house of the Chicago & Alton Railroad caught fire and was burned and one locomotive destroyed with it. The estimated damages reported by the telegraph are as follows: Chicago & Alton, $500,000; Ohio & Mississippi, $200,000; Toledo, Wabash & Western, $125,000; St. Louis, Vandalia, Terre Haute & Indianapolis, $50,000; St. Louis & Southeastern, $30,000; Wiggins Ferry Company, $25,000. A number of lives were lost, and a number of people were seriously injured.

Now that it will become necessary for most of the companies to renew their station facilities at East St. Louis, a good opportunity presents itself for a combination of interests and the construction of a great union depot which will cost less and be very much more convenient than half a dozen separate structures. Special reference should be had to connections with the bridge now in course of construction. Perhaps, however, the union depot should be in St. Louis rather than in East St. Louis, as the various Illinois roads will have their virtual termini on the west side of the river when the bridge is completed. St. Louis has now an excellent opportunity for securing a great central railroad station, which of itself would give it advantages for business not possessed by any other Western —or Eastern—city.

A New Passenger Fare Bill.

The Railroad Committee of the Illinois House of Representatives does not favor Mr. Fuller's bill limiting the charge for passenger fares on all railroads in the State to three cents a mile, and it has prepared a bill of its own in which the railroads are divided into four classes according to their earnings per mile. The first includes lines earning $10,000 or more per mile, which are limited to 2½ cents per mile. Lines earning $8,000 per mile and less than $10,000 may charge 3 cents per mile; those earning between $4,000 and $8,000, 4 cents per mile, and all earning less than $4,000, 5½ cents per mile.

This bill seems to have been drawn in the interest of the poorer roads, which the Fuller bill was likely to injure seriously, and to injure the stronger lines. The classification is made in accordance with earnings, probably because it was easy to make, for the charges should be adjusted to the cost of transportation, and not to the bulk of business. It is true that a large business can be done cheaper than a light one; but this leaves out of sight entirely the comparative cost of lines. To cite an illustration already referred to, the Illinois & St. Louis Bridge, which is a railroad less than a mile long which is to cost $5,000,000, will earn only 1-5 of one per cent. on the capital invested if it should receive $10,000 per mile, excluding aperating expenses; and if we are to permit it to return 7 per cent. on the capital it must receive $350,000 per mile, *plus* expenses of operation and maintenance. Would it be justice to limit its charges on account of its exceptionally large receipts per mile? This is an exceptional case, it is true; but there are many similar, though not equal. The law is framed on the principle that all roads cost alike per mile, and are operated at equal cost. There are single miles of railroad in this State which have cost $200,000 or more. There are sections on almost every road where the cost of hauling trains is considerably more costly than on level sections.

A question which will arise under this law is what shall be considered as a railroad line? Shall a company whose receipts average $10,000 per mile charge no more on a line or a branch of its system of roads which earns less than $4,000 per mile than on the line which earns $15,000? Shall the Chicago & Northwestern make the same rates on the Kenosha & Rockford line, whose gross receipts are perhaps sufficient to pay two per cent. on the investment, as it does on the Chicago & Fulton line, which earns $16,000 or $18,000 per mile? Shall the Chicago, Burlington & Quincy charge the same between Chicago and Quincy, where the traffic keeps the line covered with trains as on the new Mendota & Prophetstown Branch, which cannot have a heavy traffic for years?

We do not imagine, however, that the railroad companies will be much affected by the provisions of the law, except some new lines organized under the new constitution. These would have been strangled by the Fuller bill; the House bill kindly permits them to live.

Art and Engineering.

The efforts of artists to represent engineering subjects are often very amusing. Impossible locomotives and contradictory steamboats are not unusual, and men who would feel that any exhibition of their ignorance of anatomy would be a disgrace, will attempt to show the construction of machinery not nearly so complicated as the human frame and in doing so will commit the most egregious and absurd blunders.

A few nights ago at an entertainment given by an artists' club in New York the hall was decorated with allegorical pictures. Many of them showed very great talent and skill in the design and execution. One of them, however, represented the conventional mechanic with a steam-boiler on one side and a pulley supposed to be 24 in. in diameter on the other. The steam boiler was of the ordinary locomotive type, but the artist, for some reason which was not plain, located the furnace down on the side between the smoke-box and fire-box so that the grate and fire would have been under the waist of the boiler. The hub of the pully was about 1½ in. out of center, and the arms were some of them nearly twice as far apart as others. We have now before us a copy of the last number of *Every Saturday*, which has large engravings illustrating Pittsburgh and its "ways," which are literally "dark." One of the pictures is intended to represent a steam hammer, the contemplation of which work of art, we think, would produce acute symptoms of convulsion in either Bement or Miles. There is probably no reason why artists should not draw steam-boilers or hammers, if they know how to do it; but in the absence of the knowledge of the construction of these machines attempts at "generalization" or "effect" are often dangerous, if their critics happen to be mechanics. A skillful artist who knows every bone and muscle in the human body often shows his knowledge most when he draws the fewest lines, but then each one tells and represents an important fact. The lines of an amateur are prone to wander with much uncertainty, simply because he does not know *what* he should show. An oak tree well drawn should be distinguishable from an elm, and so a steam hammer should have its leading characteristics so strongly and plainly marked that the design of one maker could be distinguished from that of another. We cannot help thinking that some experience in mechanical drawing would be of benefit to most artists, especial practice in oblique projection, as there are few things which puzzle most artists so much as some kinds of foreshortening, the laws of which, if once understood, would be a key to the knottiest studies of this kind.

The New Union Pacific Directory.

The election of this company held on Wednesday last resulted in the election of a new board in which the Pennsylvania interest is prominent, quite in accordance with the report published some weeks ago. Of the fifteen members seven retire, viz.: William T. Glidden and Frederick Nickerson, of Boston; R. Hazard, of Providence; John B. Alley, of Lynn, Mass.; Cyrus H. McCormick, and C. Lambard, of New York, and O. Chapman, of Canton, O. The members of the old board who remain are Oliver Ames, Oakes Ames, John Duff and Elisha Atkins, of Boston; James Brooks and Sidney Dillon, of New York; Gen. G. M. Dodge, of Council Bluffs, Iowa, and C. S. Bushnell, of New Haven. The new members are Gardner Dexter and R. E. Robbins, of Boston; L. P. Morton, of New York; J. Edgar Thomson and Thomas A. Scott, of Philadelphia; Andrew Carnegie, of Pittsburgh, and George M. Pullman, of Chicago. Messrs. Thomson, Scott and Carnegie are representatives of the Pennsylvania Railroad Company.

The directors elected Thomas A. Scott President of the company. They secure in him perhaps the shrewdest, strongest, most successful, and, withal, most ambitious railroad financier and manager in America or the world; one who has shown an almost unequaled talent for combination, to which largely, if not chiefly, it is due that the Pennsylvania Railroad Company is today incomparably the greatest railroad corporation in America.

In accepting the presidency of the Union Pacific Mr. Scott made a speech, a part of which the telegraph reports as follows:

"As a condition precedent to accepting the position, I made the following requirements: First. All unsettled contracts for construction and equipment should

be adjusted and paid. Second. That all the floating debt of the company should be provided for, as it matures, by actual sale of assets on hand applicable to that purpose. Both of these conditions having been complied with, and a satisfactory balance in cash and assets remaining in the Treasury to provide for contingent wants, I accept the position."

As we have said before, this election gives the Pennsylvania Railroad Company a strong influence, if not a controlling power, in all the lines to the Pacific, the Kansas Pacific being controlled quite in its interest, we believe, and the Northern Pacific being managed largely by its friends, and likely to be made especially tributary to its Philadelphia & Erie line so far as heavy freight is concerned, and, probably, to the Fort Wayne road in its lighter traffic. It is not probable that any discrimination will be permitted on an y of these roads in favor of the Pennsylvania's lines, but in case of a conflict, that company would have a power which might influence to a great extent the direction of the Pacific coast traffic, and would be formidable if that traffic were large, as it doubtless will become in course of time.

The Texas Pacific Railroad.

The bill authorizing the construction of the Southern Pacific Railroad and granting aid which passed the House was amended in certain important particulars in the Senate, so that it did not then become a law, but went back to the House for its consideration of the amendments. Considerable changes were made in the House, to which the Senate consented, and the bill is now a law. It incorporates the Texas Pacific Railroad Company, with authority to construct a railroad from Marshall, Texas, westward, not far from the thirty-second parallel, across Texas to El Paso, on the Rio Grande, thence through New Mexico and Arizona to a point on the Colorado River near the southeast corner of California, and thence across California to San Diego, on the Pacific.

The bill also gives a grant of lands and authority to connect with the Texas Pacific to the New Orleans, Baton Rouge & Vicksburg Railroad Company, which is a corporation of the State of Louisiana. This company is to construct its line from Algiers, opposite New Orleans, up the Mississippi to Baton Rouge and up the valley of the Red River through Alexandria to Marshall.

The Southern Pacific Railroad of California is authorized to connect the Texas Pacific line with San Francisco from a point near the Colorado River.

Provision is made that the rights of the Atlantic & Pacific Railroad Company shall not be impaired, which means, we suppose, that it shall have the right to connect with the Texas Pacific at some point near El Paso or in New Mexico.

NEW PUBLICATIONS.

A Complete Guide for Coach Painters.—Mr. Henry Carey Baird has recently added to his very long list of "industrial publications," a book entitled "A Complete Guide for "Coach Painters, translated from the French of M. Arlot, "coach-painter, for eleven years foreman of painting to M. "Eherler, coach-maker, Paris, by A. A. Fesquet, chemist and "engineer; to which is added an appendix containing in-"formation respecting the materials and the practice of "coach and car painting and varnishing in the United States "and Great Britain."

This book is a duodecimo volume of 173 pages, about one hundred of which are occupied with the translation from the French work, and the rest with sundry selections from *The Hub*, and other journals which treat on painting. The leading work gives clear rules for the processes employed in coach and car painting, by one who was a master of the art; the appendix is more like a carriage painter's scrap book than a coherent work, but its contents are very practical and many of them valuable, though the many references to the products of certain manufacturers give the air of an advertising circular which is not likely to prepossess painters in its favor. It is, however, such a work as coach and car painters need. The price is $1.25, and it is for sale in Chicago by Cobb, Pritchard & Co. The publisher, Henry Carey Baird, No. 406 Walnut street, Philadelphia, will send it to any part of the United States free of postage, on receipt of price.

Vose's Manual of Railroads.—The new edition of this comprehensive and valuable work, which was announced more than a year ago, has been delayed by unforeseen causes, but the author has at last finished his work and it will be published as soon as it can be manufactured. It is thought that it will form a volume of about 500 pages, with about 150 wood cuts and 25 or 30 large lithographic plates.

—The traffic receipts of the Grand Trunk of Canada for the week ending February 11 amounted to £29,100, against £24,100 in the corresponding week of last year, showing an increase of £5,000, or more than 20 per cent.

Savannah & Charleston Railroad Report.

This railroad extends from Savannah, Ga., to Charleston, S. C., extending, as near as practicable, to the Atlantic coast, through the richest part of the "low country" of South Carolina. It is 104 miles long. It was destroyed during the war, and only restored so as to be open for business throughout its length last March. The annual report for the year 1870 makes the following showing:

Gross earnings for the year	$147,345 29
Operating expenses for the year	89,989 94
Excess of earnings	$57,355 35

A comparison of operations during 1870 with those of 1869, shows the following results:

	1869.	1870.	Increase.
Receipts from freight	$29,643 21	$47,712 87	$18,069 66
Receipts from passengers	17,594 60	87,096 13	69,501 53
Receipts from mails, etc	4,596 32	12,536 29	7,939 97
	$51,834 13	$147,345 29	$95,511 16
Operating expenses	46,777 56	88,989 94	
	$5,056 57	$57,355 35	
Excess of income for 1870			$52,298 78

GENERAL CONDITION OF THE COMPANY.

The whole debt is	$1,365,849 05
Of this amount there is already funded in 6 and 7 per cent. bonds	$1,112,400 00
Unfunded after applying the available credits	253,409 05

Besides this, there are ascertained liabilities for claims for rights of way, unfunded coupons, etc., which it is not possible to state with accuracy, though they are known to be not very large. The difference between these debts and liabilities and the true value of the company's property will show their true condition. This appears by the books, as follows:

Construction, equipment and right of way	$2,288,966 14
Due by contractors for over-payment and liable to be charged to construction and equipment	49,326 10
Cost of road	$2,238,292 24
Deduct amount of debt	1,365,849 05
Value of stocks, as per books	$972,443 19

The President, however, has had an inventory and a careful appraisement of the property made, and reports the actual value to be $2,094,300, or but a trifle more than $20,000 per mile.

The Effects of Cold on Iron and Steel.

The following are the reports of papers on the effect of variations of temperature on the strength of iron and steel, read at the last meeting of the Manchester Literary and Scientific Society:

THE EFFECTS OF COLD UPON IRON.

Mr. William Brockbank, F. G. S., read "Notes on the Effects of Cold upon the Strength of Iron." The severity of the present winter, he said, has brought the question of the effects of low temperature upon the strength of iron very prominently before the public, and it is a curious circumstance that a subject of so great importance should have escaped the attention of writers on iron to such an extent, as that it is either ignored, or dismissed with a few brief remarks or inconclusive experiments, which leave the subject altogether unsettled. After referring to the observations and experiments on the effects of low temperatures on on the strength of cast and wrought iron in the works of Sir W. Fairbairn, Dr. Percy and David Kirkaldy, and pointing out the inconclusiveness of all the experiments hitherto recorded, the writer went on to detail the following experimentt, which he had, by the kindness of the several parties named, caused to be made during the severe frosts which have recently prevailed, and which have in all cases been carried out with the greatest care and exactness. Experiments on the transverse strain of cast-iron bars were made at the works of Messrs. P. R. Jackson & Co., of Salford, and were repeated thrice, with the following results: In Mr. Fairbairn's experiments only one sort of pig iron was employed. It is now well known that a much sounder and more regular casting can be obtained by a judicious admixture of several suitable kinds of pig iron; a very probable source of error would thus occur in Mr. Fairbairn's experiments, and this will probably point to the unsatisfactory results he obtained. The bars employed in the present experiments were made from a mixture of four pig irons of the highest class, added to some good scrap iron; they were all poured from the same ladle, and were molded from the same model, and they were remarkably regular in size and quality, so that the results may be fairly relied on. The castings were all made on Friday, the 30th of December last, and the bars were tested on the following Tuesday, January 3, 1871. The machine used was a powerful lever or steel yard, the bars having a 3 ft. bearing, and the results were taken with all possible care. Experiments upon the tranverse strain of cast iron at low temperature were made at the works of Messrs. P. R. Jackson & Co., Salford, January 3, 1871, by W. Brockbank, F. G. S. The mixture of metals was Cleator hematite, Pontypool cold blast, Bleanavon cold blast, and and Glengarnock hot blast pig iron, with some good scrap iron. All the bars cast from one ladle. The results showed a gradual and considerable decrease of strength in the bars, with the increase of cold below the freezing point. They also lost their elasticity in a similar degree. A further trial was made at Messrs. Jackson's works with similar bars, and the same admixture of metals, January 10. These experiments are borne out by the general experience of ironfounders, many instances having come to his knowledge during these investigations, a few examples of which may be cited. 1. He found it a matter of general opinion that pig iron breaks much more easily in frost than in ordinary temperatures, and that breakages of castings are much more frequent in frosty weather. 2. In rolling mills, and particularly where chilled rolls are employed, especial care has to be used in frosty weather to warm the rolls before using them, and when in use to keep them carefully covered from the frosty air If not properly protected and carefully managed they are found to be very liable to fracture. 3. Mr. Edgar Gilkes, of Middlesbrough, informed him that the cast-iron wheels of the chaldron wagons of the Stockton & Darlington Railway are found to fracture very frequently in frosty weather, and in a severe frost it is sometimes quite a serious matter. 4. Messrs Peel, Williams & Peel had a remarkable example on January 5 (20° Fahr.) An hydraulic cylinder had been cast upon a cast-iron hollow core bar 7 in. in diameter and 1¼ in. thick, coated with 1½ in. of loam and hay. It was put out in the yard to cool during the severe frost, and when they came to draw the core bar it broke by the mere torsion, and was found to be quite brittle. A portion of this core bar was warmed, and it was then found to have recovered its nature, and to be quite strong and tough. The lowest temperature on this date was 19° Fahr., and the casting was exposed to it for many hours. Numerous other examples could be readily furnished if required. There can, therefore, be no doubt whatever that the strength of cast iron is very materially lessened by severe cold. For experiments in wrought iron he was indebted to many friends, and the results are of similar import. His first experiments were directed to the method adopted by Mr. Kirkaldy, and he soon found that neither by torsion nor gradual tensile strain could the true result be ascertained, as the bar almost immediately became heated under the strain, and the effects of frost at once disappeared. The following experiments, made by Mr. William Johnson, of the Messrs. Johnson's Iron Works, Bradford, near Manchester, will illustrate this conclusively. A coil of galvanized wire, 5½ B. W. gauge, was left in the open hair for twenty-four hours during severe frost, December 24, 1870; twenty-four pieces, 1 yard in length each, were then cut off; of these six were tested for tensile strength by the direct application of weights, and six for torsion—the same tests were used for the remaining twelve after they had been warmed to about 80°. The results were as follows:

Tension.		Torsion.	
At 20°	At 80°	At 20°	At 80°
lb.	lb.	Twists.	Twists.
2,142	2,142	16½	14½
2,114	2,058	15½	14½
2,114	2,086	9	13½
2,142	2,086	14½	14½
2,114	2,128	16	12½
2,114	2,086	18½	14
Total.....12,740	12,586	90	83½
Average....2,123.3	2,097.6	15	13.9

Thus in both experiments the iron tests were worse when warm than when frozen. In each case the wire immediately became warm. Mr. F. Monks, of the Whitecross Wire Works, Warrington, also tested wire rods for him with precisely similar results. Finding these experiments to be unsatisfactory, he arranged for a series to be tried by the more rough-and-ready method of the striker's hammer, which he judged would be more likely to show the true state of the iron in its frozen condition. The result either of gradual torsion or tension is to expel the frost there may be in the bar almost immediately, so that in the further progress of the trial there is no difference between bars which were originally either cold or warm. If low temperatures have any influence in rendering iron weaker or more brittle, the only way in which the amount of such influence can be realized is by a sudden impact, and the striker's hammer was the readiest appliance for the purpose. In the following experiments great care was taken that the blows should be as nearly as possible of the same force in each trial, and as the experiments were all carefully conducted, and are vouched for by the parties named, they may be fairly relied on as representing truly the facts of the case. 1. William Bouch, Esq., C. E., Engineer of the Stockton & Darlington Railway, made the following experiment, December 29, 1870, the temperature at the time being 26°, but it had been as low as 19° over night. A bar of round iron, 1⅛ in. diameter, of best quality, was taken from the yard, being then coated with ice; it had been exposed to a week's hard frost. It was held over the edge of a smith's anvil, and one blow from a 12 lb. hammer by the striker broke a piece 4 in. long, short off, the fragments flying 12 yards along the floor of the workshop. The same bar was then put into the mouth of a furnace, but not in contact with any flame, for a short time, to unfreeze it. The heat received into the bar was so moderate that a smith could grasp it with his hand. It was then allowed to lie on the floor for some time, until it had quite cooled down to the temperature of the workshop. It was now placed on the anvil, and the same striker as in the first experiment, with the same hammer, gave fourteen blows without causing the slightest fracture, the bar being merely bent about 2 in. Mr. Bouch adds that he has, in his experience, met with many cases nearly as convincing as the above. 2. Mr. Robert Peel, of Messrs. Peel, Williams & Peel, Manchester, had kindly made for him the two following experiments with boiler-plate iron, as shown by the samples now on the table, viz.: No. 1. A strip of boiler plate, of best quality was taken from the open yard, where it had lain during several days of severe frost, January 5, 1871, temperature about 20° Fahr. It was laid across the anvil, and a striker, with a single blow of a 14 lb. hammer, broke off the piece now exhibited. The fracture shows a very "short" crystalline face, without any appearance of fiber, and is torn and irregular, in remarkable contrast to sample No. 2, which is from the same piece, viz., No. 2. The remain, der of the above strip was slightly warmed to dispel the frost, and then allowed to cool to the temperature of the shop. It required several blows from the same hammer, and bent considerably before breaking, being exceedingly tough and fibrous. The fracture shows a good fibrous structure, except on the inner side of the

Plate V.

Pennsylvania Railroad Shops
West Philadelphia

End Elevation and Section
Locomotive and Machine Shop

Scale

Feet

Plate VIII.

Pennsylvania Railroad Shops, West Philadelphia.

Scale

Scale of Detail

Feet

Feet

Construction Dep.t Penn.a R.R.

Stack

Plate VII.

Section through Boiler & Engine Rooms.

Scale

Feet.

Plate IV.

Pennsylvania Railroad Shops.
West Philadelphia.
Locomotive & Machine Shop.

Boiler Room

Engine Room

Stack

Blacksmith Shop

Tool Room

Office

Scale

Feet

Plate VI.

Pennsylvania Railroad Shops
West Philadelphia

Fig 1

Fig 2.

Fig 3

Details
Locomotive & Machine Shop.

Feet

Inches

Scale Fig 1 & 2

Scale Fig 3.

Section through Furnace of Boiler.

Scale

Feet.

curve, where there is a thin crystalline skin. The difference of appearance in these two fractures is very striking and remarkable, and can only be accounted for by the action of extreme cold. No. 1 A. This experiment was made on January 6, temperature about 26° Fahr. A strip of Low Moor best boiler plate was taken out of the snow, having lain there during several days of intense frost. It was laid across the anvil, and broken off short with a single blow from a 14-lb. hammer. The fracture is fibrous, but with patches of crystals, especially on the edges of the plate; the general appearance is "short" or "tender," very different from the usual character of Low Moor iron in its normal state. No. 2 A. The remainder of the same strip was placed in the drawing office at a temperature of 70°, and allowed to lie there for some hours. It then required six blows from a 14-lb. hammer, the plate being reversed each time, the grain being thus severely bent backwards and forwards, under heavy blows, before it severed. The outer skin still remained in cohesion, and it had to be separated by bending backwards and forwards in the smith's hands. This fracture shows a splendid quality of iron, the fiber being bent in both directions as the blows were alternately reversed. There is a slight crystalline line on the skin of one side. Mr. F. Monks, of the Whitecross Wire Company, Warrington, had kindly made the following experiments with wire billets, which are the very toughest form of iron manufactured: The wire exhibited is made from one of the same bars, and will clearly show the quality of the iron. The billets are 1¼ in. square, being in the semi-manufactured form ready for the final heating and re-rolling into wire. They had been lying in the open air several days during severe frost. Experiment tried January 1, 1871, 10° lowest to 30° highest temperatures. Three bars were broken in the open air. They failed to break with 22 blows with a 15-lb. hammer. A small nick ⅛ in. deep was then cut, with three light blows on a "set," in the top of each bar, and at another part of it, after which a single bar sufficed to break each bar. The bars were then thawed and allowed to cool to the usual temperature, or about 70°; 22 blows were given to each as before, and the same nick was made on one side as nearly as possible like the frozen bars had been treated. One bar then broke after 11 blows, one after 10 blows, and one after 6 blows. The frosted bars are more crystalline, and show no signs of fiber; the other bars show a good amount of fiber, and are slightly crystalline in the fractures.

The following experiments with rails were made at the works of the Darlington Iron Company, November 30, 1869: The rails were taken promiscuously from a lot of 1,000, all supposed to be of the same quality, weight, and exact section. It had been found that the rails which were then in course of manufacture for the East Indian railways, at these works, and which were of a very high quality, failed to pass the required test in frosty weather, whereas in ordinary temperatures a failure was a very rare occurrence. The ten rails were accordingly selected to settle the question whether higher and lower temperature affected the strength of the rails. Four rails were heated up to 120° Fahr.; the other six were tested cold, the temperature of the atmosphere being about 26°. At 120° all the bars stood two 5 ft. blows and one 7 ft. blow At 26° only one bar stood two 5 ft. blows, three broke at the second 5 ft. blow, and one at the first 5 ft. blow. At 60° all would probably have passed the test easily, many thousands having previously done so from the same lot. It will therefore be seen that the results are in perfect agreement in all these experiments, showing that bad iron, boiler plates, wire billets, and rails are most materially weakened by the action of intense cold, losing all their toughness, becoming quite brittle under sudden impact, and having their structures changed from fibrous to crystalline. Similar instances could be given in illustration of this in the daily practice of engineering. In large works the breakages of wrought iron are very considerable during frosts. Quarrymen find that their chains are very liable to fracture from the same cause; and doubtless the numerous accidents of falling tires in our railways may be attributable to it. In many cases, however, the contraction of iron must also be taken into account, as it is a serious item. In conclusion, he thought it could not be doubted, after the above recital, that iron does become very much weaker, both in its cast and wrought state, under the influence of low temperatures. This subject is one of such paramount importance that a careful series of investigations ought to be undertaken by one of our scientific bodies, to ascertain the precise nature of the changes which are thus shown to take place, as there is herein an item which materially affects the stability of all iron structures during frosty weather, and which has not hitherto been adequately recognized.

[To be Continued.]

Railroad Celebration in Turkey.

In this country celebrations of the opening of new railroads are very common and often very enthusiastic. The following account of the way they do such things in Turkey will be interesting. We take it from an English paper:

From Constantinople of the 11th inst., it is stated that the inaugural ceremony of opening the short section of this line from Yedi-Koule to Kutchuk Tehemedji was successfully performed—brilliantly, we might say, had not the absence of the Sultan somewhat detracted from the *eclat* of the proceedings. The day being fine, crowds of spectators gathered round the station; many of the houses were decked with flags, and the house-tops were occupied by the female population of the neighborhood. Within the precincts of the station flags, banners, streamers, and a profusion of evergreens, disguised the unpretending and unfinished structure, and a crowd of invited guests, among whom were a number of ladies, sipped chocolate and awaited the arrival of the Grand Vizier. Shortly after half past eleven, the Ministers and other State functionaries began to arrive, and at 11:50 Ali Pasha took his place in a tent pitched by the side of the vacant Imperial pavilion, and in which the chief members of the government were, by that time, already assembled. A hodja pronounced a benediction on the enterprise, and then the excursion train, consisting of the Imperial saloon-carriage and seven other carriages, drew up in front of the tent. The limited amount of rolling stock which the company at present possesses necessitated the limitation of the invitations for the trip to 250, and the party was composed almost exclusively of officials, who naturally had the first claim upon the hospitality of the company. The Grand Vizier and his colleagues occupied the State saloon, and the remainder of the guests filled up the rest of the carriages, without, however, any overcrowding or discomfort. In fact, from beginning to end, the proceedings were well arranged, and being unambitious, were in perfect keeping with the achievement they were designed to commemorate. The train ran at an easy pace through the old wall, and traversed the Turkish cemetery beyond, where a picturesque gathering of women formed gay groups among the cypresses and moss-grown tombstones. On, at the same sober pace, through market-gardens, and out upon the bare moorland, past the powder-factory, marsh and reeds, and whirling flights of cormorants, a leaden sea, and the haze-masked outline of Bythynia, to the left; to the right, treeless, half-cultivated slopes, teams of lean oxen, toiling in the sticky soil, and here and there a farmer's homestead standing out alone upon the bleak void. Soberly on, past San Stefano, where rows of children in tinted nightgowns sung hymns to the Padishah, incited thereto by a loyal and orthodox priest; and then the flags and streamers of Kutchuk-Tchekmedji loomed ahead, and a whistle and a bell announced the fact that the first public railway journey out of old Byzantium had been performed. The journey, which is 15 kilometers, or about 10¼ English miles, in length, occupied fifty minutes. To lunch and to return completed the programme. The repast was served in a room in the station which was too small for the purpose; that is to say, the effect, according to English precedents, would have been better if the whole party had sat down together, instead of taking their refreshments in detachments; but the *de jeuner* in itself was both excellent and ample. At 2:40 the return train started, and reached the Yedi-Knule terminus at 3:25. The cemetery, as the homeward-bound excursionists passed it, was crowded with spectatators; but they silently watched the strange sight, and not a shout or cheer was heard. On alighting from the train, Ali Pasha adjourned again to his tent, and conferred decorations on the following gentlemen connected with the enterprise: on Baron Hirsch, the grand cordon of the Medjidieh; on Mr. Lang, Director-General; Mr. Pressel, Chief Engineer; Mr. Bontoux, Director-General of the South Austrian Railway, and connected with the "Societe d'Exploitation" of the Roumelian railways, as also upon Mr. Seidler, of the Anglo-Austrian Bank, and Mr. Brouwer, a member of the administration—the Medjidieh of the 3d class; on Count Schonfeldt, Mr. Secretary Ditz, and six gentlemen of the engineering staff, that of the 4th class; and on Messrs. Knaffl and Bastendarfer, that of the 5th of the same order. The most noteworthy feature in the proceedings was the perfect order and the entire absence of the bustle and scramble which often attend similar ceremonials. There was not the slightest hitch or *contretemps* of any kind, and although, from the slowness of the speed at which the trip was performed, it is impossible to form an opinion from it alone as to the quality of the line, it was doubtless prudent—considering how saturated the new earthworks are with moisture, and how inauspicious even a trifling accident would have been on such an occasion—to aim at a safe rather than at a rapid journey.

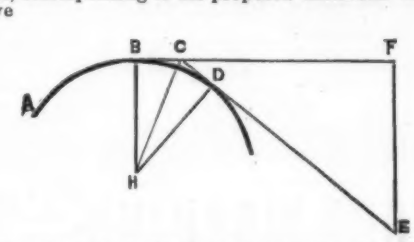
Laying Out Railroad Curves.

Wm. Rock, Civil Engineer, contributes to *Van Nostrand's Engineering Magazine* the following:

"Having run a curve of given radius from A to B, and a tangent from B to F, let it be required to continue the curve to some point, D, so that the tangent D E shall pass through E at a given distance from F.

"Let R = the given radius B H or H D; let B F = d and E F the given distance = p.

Let x = tangent of B H C, one-half of the central angle, corresponding to the proposed extension of the curve



"Now by the principles of trigonometry, the natural tangent of F C E(=2 B H C) will be equal to $\frac{2x}{1-x^2}$. Also B C = R x, and C F = d — R x.

"Therefore, E F = $\frac{2x}{1-x^2}(d-\mathrm{R}x)$. But this is the given distance p.

"We have therefore, $\frac{2d x-2\mathrm{R}x^2}{1-x^2}=p$.

"From which we get $(2\mathrm{R}-p)x^2-2dx=-p$, which being solved gives

$$x=\frac{d+-(d^2+p^2-2\mathrm{R}p)^{\frac{1}{2}}}{2(\mathrm{R}-p)}$$

which is the formula required.

"The double sign indicates that two different tangent lines from the same curve may pass through the given point. In practice there is no difficulty in determining which sign to use.

"This formula is very useful in changing the position of a long tangent."

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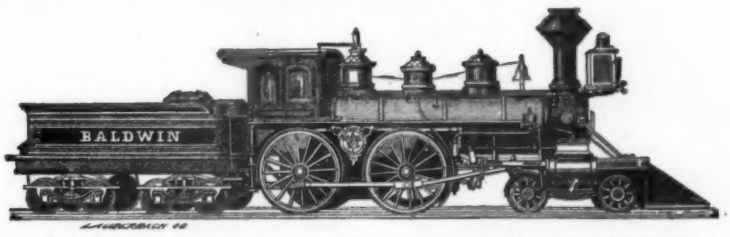

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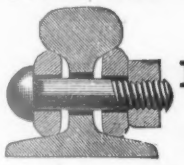

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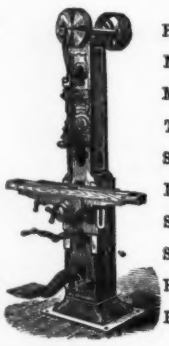

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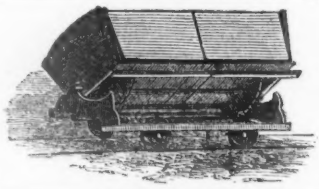

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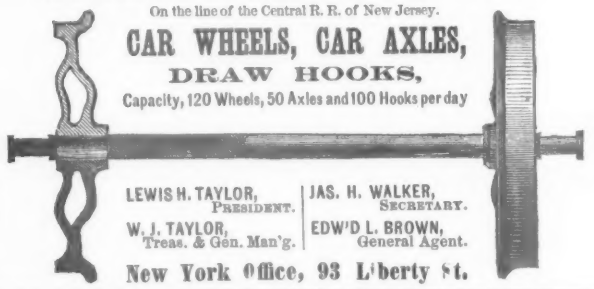

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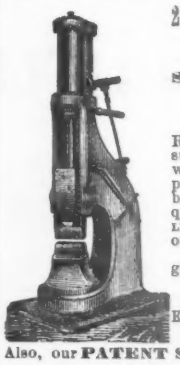

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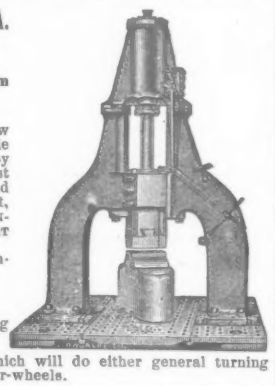

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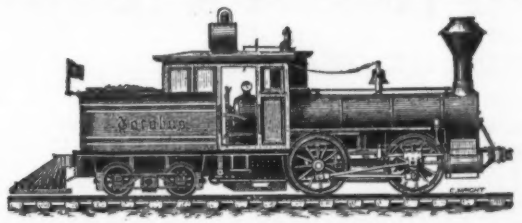

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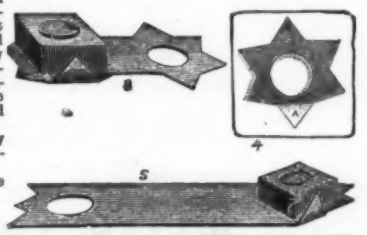

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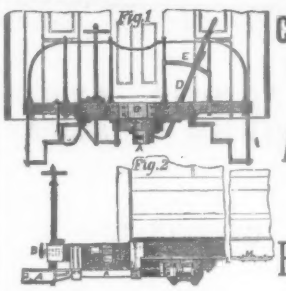

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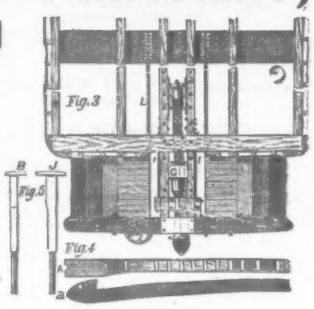

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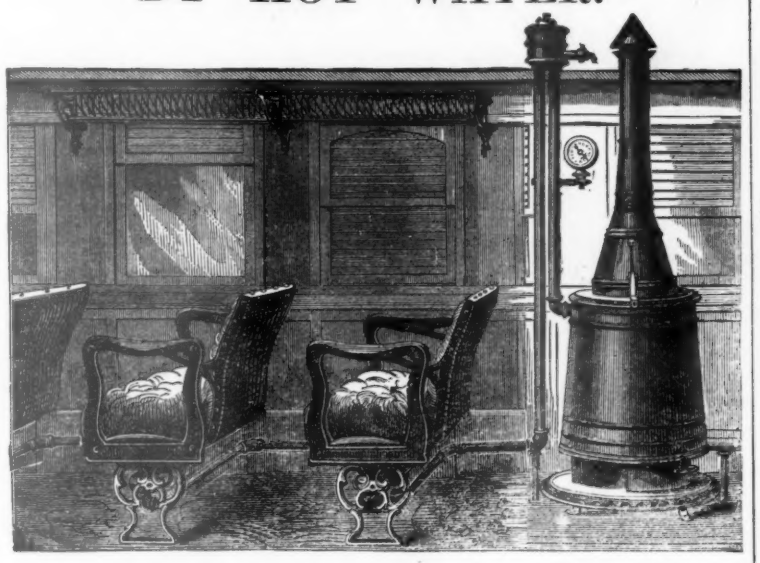

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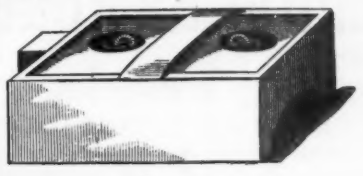

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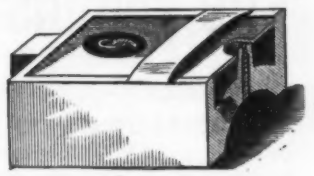

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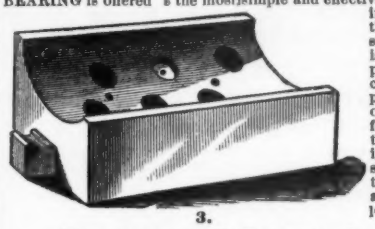

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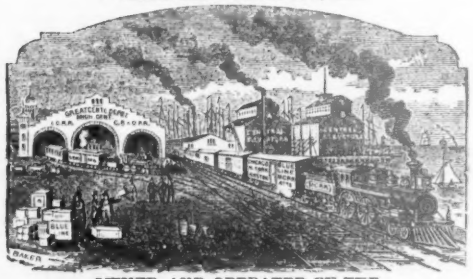
1871.  1871

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are all of a solid, uniform build, thus largely lessening the chances of delay from the use of cars of a mixed construction, and the consequent difficulty of repairs, while remote from their own roads. The Blue Line is operated by the railroad companies who own it, without the intervention of intermediate parties between the Roads or Line and the public.

Trains run through with regularity **IN FOUR OR FIVE DAYS** to and from New York and Boston. Especial care given to the Safe and Quick Transport of Property Liable to Breakage or Injury, and to all **Perishable Freight.**

Claims for overcharges, loss or damage, promptly settled upon their merits. Be particular and direct all shipments to be marked and consigned *via*

"BLUE LINE."

☞ *FREIGHT CONTRACTS* given at the offices of the company in Chicago, New York and Boston.

J. D. HAYES, GEN. MANAGER,..Detroit. | P. K. RANDALL, 69 Washington St., Boston,
C. E. NOBLE,.... } 349 Broadway, N. Y. | J. JOHNSON,.....Cairo, Ill.
GEO. E. JARVIS,... } | N. D. MUNSON,.....Quincy, Ill.

THOS. HOOPS, GEN. FR'T AGT. Michigan Central Railroad, Chicago.
A. WALLINGFORD, AGT. M. C. & G. W. R. R., No. 91 Lake St., Chicago.
F. H. STEWART, Freight Agent Michigan Central Railroad.
JNO. CRAMPTON, Gen. Ft. Agt. Great Western Railway, Detroit, Mich.

Empire Line.

THE EMPIRE TRANSPORTATION COMPANY'S

Fast Freight Line to the East

—AND—

TO THE COAL AND OIL REGIONS,

Via Michigan Southern, Lake Shore, and Philadelphia & Erie R. R.'s,

WITHOUT TRANSFER!

Office, No. 72 LaSalle Street, Chicago.

GEO. W. RISTINE, Western Superintendent, Cleveland, Ohio.
W. G. Van Demark,..265 Broadway, New York. | E. L. O'Donnell,.....Baltimore, Md.
G. B. McCulloh,....42 South 5th St., Philadelphia. | Wm. F. Smith,.....Erie, Penn
JOHN WHITTAKER, Pier 14 North River, New York.

JOSEPH STOCKTON, Agent, Chicago.

W. T. HANCOCK, Contracting Agent.
WM. F. GRIFFITTS, Jr., Gen. Freight Agent, Philadelphia.

JOHN B. TAFT AGENT. No. 10 OLIVER STREET, BOSTON. Taylors Leeds.

TAYLOR BROTHERS & CO.

CAST STEEL LOCOMOTIVE TYRES,

Best Yorkshire Bar Iron

— AND —

BOILER PLATES.

This Iron is unequaled for strength and durability, soundness and uniformity. It is capable of receiving the highest finish, which renders it peculiarly adapted to the manufacture of Locomotive and Gun Parts, Cotton and other Machinery Chain Bolts, &c.

Sole Agency for the United States and Canadas

The Lightest Running,

EASIEST RIDING,

— AND —

Most Economical

STREET CAR

IN USE.

HIGLEY'S PATENT

Street Car Running Gear

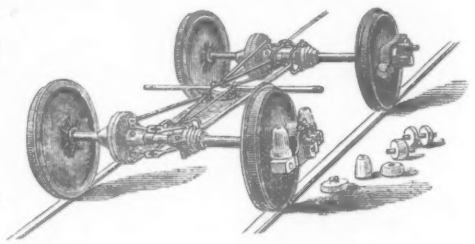
— AND —

BRAKE,

Made and Sold by

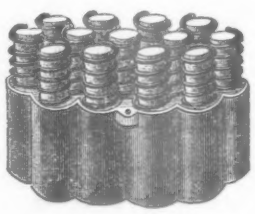
The McNairy & Claflen Manuf'g Co.

CLEVELAND, O.



Union Car Spring Mf'g Co.

Sole Proprietors of the



Wool-Packed Spiral.

Hebbard.

HEBBARD CAR SPRING!

Offices: No. 4 Dey St., New York, and 19 Wells St., Chicago.

FACTORIES: JERSEY CITY, N. J., and SPRINGFIELD, MASS.

Vose, Dinsmore & Co.,

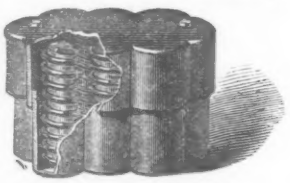
NATIONAL SPRING WORKS,

MANUFACTURERS OF

VOLUTE BUFFER, INDIA RUBBER, RUBBER CENTER SPIRAL, COMPOUND SPIRAL, "DINSMORE,"

AND OTHER

RAILWAY CAR SPRINGS.



"Dinsmore" Spring. Volute Buffer Spring. Group Rubber Center Spiral Spring.

No. 1 Barclay St., NEW YORK. | **No. 15 La Salle St., CHICAGO.**

WORKS ON **129th** AND **130th** STREETS, NEW YORK.

GEO. WESTINGHOUSE, Jr., Pres. ROBERT PITCAIRN, Treas. RALPH BAGALEY, Secretary

Westinghouse Air Brake Company,

OF PITTSBURGH. Incorporated by the State of Pennsylvania, 1869.

MANUFACTURERS OF

THE WESTINGHOUSE AIR BRAKE!

A simple, cheap and effective invention, whereby the entire control of a train of cars is placed in the hands of the Engineer. It is in daily use on a number of the leading Railroads, and is recommended by the most prominent railroad mechanics in the country as an actual necessity.

A Trial Train furnished to any Railroad Company, to be paid for only when found satisfactory. Full information furnished on application.

General Freight and Ticket Department.

Leavenworth, Lawrence & Galveston RAILROAD LINE.

IN CONNECTION AT KANSAS CITY WITH THE

Chicago, Burlington & Quincy R. R., Hannibal & St. Joseph R. R., North Missouri R. R. and the Pacific R. R. of Missouri,

— FORMS THE —

SHORTEST, QUICKEST & MOST RELIABLE LINE

For FREIGHT and PASSENGERS from the EAST,

Via CHICAGO and ST. LOUIS, to

SOUTHERN KANSAS, THE INDIAN TERRITORY

— AND —

TEXAS!

THROUGH BILLS OF LADING given by any of above-named roads, to points ON OR SOUTH OF THEIR LINE, and such Contracts protected by this Department.

TRUNK LINE CLASSIFICATION ACCEPTED. FREIGHT FROM THE EAST THROUGH TO THE INDIAN COUNTRY WITHOUT CHANGE OF CARS.

THROUGH TICKETS For sale at all principal points East to the different places in Kansas, via this line.

PULLMAN'S SLEEPING CARS ON ALL THROUGH TRAINS!

☞ Full information as to rates and time, either Freight or Passenger, furnished by General Freight Agents of above-named roads.

☞ **Special Rates** given to Colonies. For full information as to rates, time, or description of country, apply to the undersigned.

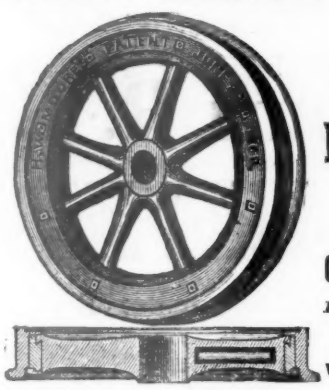
M. R. BALDWIN, Superintendent, Lawrence, Kansas.

CHAS. B. PECK, Gen. Freight and Ticket Agent, Lawrence, Kan

MOORE

Steel Elastic Car Wheel Co.

OF NEW JERSEY.



Proprietors of

MOORE'S PATENT

FOR THE MANUFACTURE OF

ELASTIC CAR WHEELS,

FOR PASSENGER AND SLEEPING COACHES.

Noiseless, Safe, Durable and Economical.

Also, Manufacturers of

CAR WHEELS OF EVERY DESCRIPTION.

H. W. MOORE, President.
JAS. K. FROTHINGHAM, Secretary.
F. W. BLOODGOOD, Treasurer.

Works, cor. Green and Wayne Sts., JERSEY CITY, N. J

P. O. Address- Box 129, Jersey City, N. J.

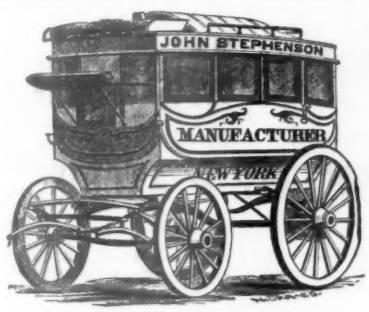
American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance. OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO. 234 West 29th Street, New York.

BLISS, TILLOTSON & CO., Western Agents, 247 South Water Street, Chicago.



OMNIBUSES

—OF—

EVERY STYLE!

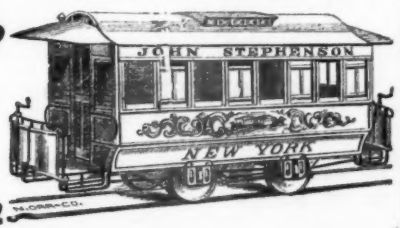
☞ Orders Promptly Filled. ☜

CARS,

LIGHT, STRONG

—AND—

ELEGANT!



CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.

☞ THE DIRECT ROUTE FOR

JOLIET, MORRIS, OTTAWA, LASALLE, PERU, HENRY, PEORIA,

Lacon, Geneseo, Moline,

ROCK ISLAND, DAVENPORT,

Muscatine, Washington, Iowa City,

GRINNELL, NEWTON, DES MOINES,

COUNCIL BLUFFS & OMAHA!

CONNECTING WITH TRAINS ON THE UNION PACIFIC RAILROAD, FOR

Cheyenne, Denver, Central City, Ogden, Salt Lake, White Pine, Helena, Sacramento, San Francisco,

And Points in Upper and Lower California; and with Ocean Steamers at San Francisco, for all Points in **China, Japan, Sandwich Islands, Oregon and Alaska.**

☞ TRAINS LEAVE their Splendid new Depot, on VanBuren Street, Chicago, as follows:

	LEAVE.	ARRIVE.
PACIFIC EXPRESS, (Sunday excepted)	10.00 a. m.	4.15 p. m.
PERU ACCOMMODATION, (Sundays excepted)	4.30 p. m.	9.45 a. m.
PACIFIC EXPRESS, (Saturdays excepted,)	10.00 p. m.	[Mon. ex. 7.00 a. m.

ELEGANT PALACE SLEEPING COACHES!

Run Through to Peoria and Council Bluffs, Without Change.

☞ Connections at LA SALLE, with Illinois Central Railroad, North and South; at PEORIA, with Peoria, Pekin & Jacksonville Railroad, for Pekin, Virginia, &c.; at PORT BYRON JUNCTION, for Hampton, LeClaire, and Port Byron; at ROCK ISLAND, with Packets North and South on the Mississippi River.

☞ **For Through Tickets,** and all desired information in regard to Rates, Routes, etc., call at the Company's Offices, No. 37 South Clark Street, Chicago, or 257 Broadway, New York.

A. M. SMITH, Gen. Pass. Agent. HUGH RIDDLE, Gen. Supt. P. A. HALL, Asst. Gen. Supt.

KANSAS PACIFIC RAILWAY.

Great Smoky Hill Route

THROUGH **KANSAS** TO **DENVER,** COLORADO,

Connecting with the DENVER PACIFIC R. R. for CHEYENNE; forming, in connection with the UNION and CENTRAL PACIFIC R. R.'s, a NEW ALL-RAIL ROUTE to

Colorado, Wyoming, Utah, Montana, NEVADA, CALIFORNIA,

AND THE PACIFIC COAST.

THE ONLY ROUTE RUNNING PULLMAN DRAWING-ROOM & SLEEPING CARS THROUGH TO DENVER.

☞ **No Omnibus or Ferry Transfer!** ☜

☞ Direct Connections made in UNION DEPOTS at **Kansas City** [State Line,] with the Hannibal & St. Joseph, North Missouri and Missouri Pacific Railroads.

☞ Daily Trains leave Kansas City, State Line and Leavenworth, for Lawrence, Topeka, Emporia, Humboldt, New Chicago, Chetopa, Junction City, Abilene, Salina, Brookville, Ellsworth, Hays, KIT CARSON, DENVER, GREELEY, CHEYENNE, OGDEN, SALT LAKE CITY, CORINNE,

Sacramento & San Francisco.

☞ Connect at Kit Carson with Southern Overland Passenger and Mail Coaches for PUEBLO, TRINIDAD, SANTA FE, and all principal points in

Old and New Mexico and Arizona.

☞ Connect at DENVER with the Colorado Central Railroad and Fast Concord Coaches, for Golden City, Black Hawk, Central City, Idaho City, Georgetown and Fair Play.

Passenger and Freight Rates as low and conveniences as ample as by any Route.

Ask for Tickets via KANSAS PACIFIC RAILWAY, which can be obtained at all principal ticket offices in the United States.

BEVERLY R. KEIM, Gen. Ticket Agt. Lawrence, Kansas. **T. F. OAKES,** Gen. Freight Agt. Kansas City, Mo. **A. ANDERSON,** Gen. Sup't. Lawrence, Kan.

FARMS AND HOMES IN KANSAS.

Five Million Acres of Choice Farming Lands, situated along the line of this Great National Route, at from one to six dollars per acre. For full particulars, apply to

JNO. P. DEVEREUX, Land Commissioner, Lawrence, Kan.

THE ERIE & PACIFIC DISPATCH CO.

Are Authorized Freight Agents.

For information, Contracts, and Bills of Lading, apply at their office, 64 Clark Street, Chicago.

H. H. RAPP, AGT.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,

— TO —

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent. **D. A. OLIN,** Gen. Superintendent.

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy
RAILROAD LINE.

3 THROUGH EXPRESS TRAINS DAILY!

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
TO OMAHA, - - -	23	$20.00	TO DENVER, - -	2½	$63.00
" ST. JOSEPH, - -	21	19.50	" SACRAMENTO, -	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE

7:40 A. M. MAIL AND EXPRESS, (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

10:45 A. M. PACIFIC FAST LINE, (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all stations West and South of Galesburg.
☞ ELEGANT DAY COACHES and PULLMAN PALACE DRAWING ROOM CARS are attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

9.00 P. M. PACIFIC NIGHT EXPRESS, (Daily, except Saturday,) for Burlington, Ottumwa, DesMoines, Nebraska City, Council Bluffs, Omaha, and all points West. Pullman Drawing Room Sleeping Car attached to this Train daily from Chicago to Burlington, and Elegant Day Coaches, from Chicago to Council Bluffs and Omaha, without change! This is the Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

—RUNNING THE CELEBRATED—

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

Chicago & Keokuk,

And the Only Route Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

7.40 A. M. MAIL AND EXPRESS (Except Sunday,) stopping at all stations between Chicago and Galesburg; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Dunleith, Dubuque, La Salle, El Paso, Bloomington, &c.

10:45 A. M. PACIFIC EXPRESS, (Daily, except Sunday,) with ELEGANT DAY COACHES and PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, Without Change!

9:00 P. M. PACIFIC NIGHT EXPRESS, (Daily,) with Pullman Palace Drawing Room Sleeping Car attached running through from Chicago to QUINCY,

Kansas City, Lawrence, Topeka and Denver,
☞ WITHOUT CHANGE! ☜
64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN
Chicago and Kansas City!
WITHOUT CHANGE OF CARS OR FERRY.

115 MILES The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION.7:00 A. M. 1:30 & 6:15 P.M
GALESBURG PASSENGER.....3:00 P. M.
MENDOTA PASSENGER.....4:15 P. M.
AURORA PASSENGER.....5:30 P. M.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, at Company's office, 63 Clark Street, and at Great Central Depot, Chicago at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO.

THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

HANNIBAL & ST. JOSEPH
SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

115 MILES THE SHORTEST!

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

64 MILES THE SHORTEST!

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

THIS is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

Through Tickets for Sale at all Ticket Offices. Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

P. B. GROAT, Gen. Ticket Agent. HANNIBAL, MO
GEO. H. NETTLETON, Gen. Supt. HANNIBAL, MO.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton,

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

	Depart.	Arrive.
EXPRESS MAIL	*9:15 A. M.	*8:05 P. M.
JOLIET ACCOMMODATION	*4:00 P. M.	*9:40 A. M.
NIGHT EXPRESS	†5:30 "	*12:50 P. M.
LIGHTNING EXPRESS	‡9:00 "	*7:30 A. M.

*Sundays excepted.
†Daily; Saturdays it runs to Bloomington only.
‡Saturdays and Sundays excepted. Monday mornings this train runs from Bloomington to St. Louis.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

—IS—

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

50 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ Three Through Express Trains Daily! ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ FOR TICKETS, apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

JAMES CHARLTON, Gen. Pass. and Ticket Agent, St. Louis.
W. R. ARTHUR, General Superintendent, St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK, General Superintendent.

ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST.

ST. LOUIS AND CHICAGO
THROUGH LINE.

No Change of Cars from Chicago to St. Louis.

9:20 A. M. DAY EXPRESS Sundays Ex.
Arriving in ST. LOUIS at 10:30 P. M.

8:15 P. M. FAST LINE. Saturdays Excepted.
Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN,

Denver and San Francisco!

CAIRO, MEMPHIS AND NEW ORLEANS LINE.

No Change of Cars from Chicago to Cairo.

9:20 A. M. CAIRO MAIL, Sundays Excepted.
Arriving at **Cairo** 2:05 A. M., **Memphis** 12:45 P. M., **Mobile** 9:25 A. M. **Vicksburg** 9:25 A. M., **New Orleans** 11:05 A. M.

8:15 P. M. CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 12:34 P. M., **Memphis** 4:15 A. M., **Little Rock** 7:00 P. M., **Vicksburg** 8:10 P. M., **New Orleans** 1:30 A. M.

4:50 P. M. CHAMPAIGN PASSENGER,
Arriving at **Champaign** at 10:45 P. M.

☞ THIS IS THE ONLY DIRECT ROUTE TO

Humboldt, Corinth, Grand Junction, Little Rock, Hot Springs, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

GALVESTON, INDIANOLA,

And all Parts of Texas.

☞ NOTICE.—This Route is from 100 to 150 MILES SHORTER, and from 12 to 24 HOURS QUICKER than any other.

THIS IS ALSO THE ONLY DIRECT ROUTE TO

DECATUR, TERRE HAUTE, VINCENNES & EVANSVILLE.

Peoria and Keokuk Line.

9:20 A. M. KEOKUK PASSENGER, Sun. Excepted.
Arriving at **Chenoa** 3:20 P. M., **El Paso** 4:08 P. M., **Peoria** 5:42 P. M., **Canton** 7:15 P. M., **Bushnell** 8:57 P. M., **Keokuk** 11:15 P. M., **Warsaw** 11:40 A. M.

Elegant Drawing Room Sleeping Cars

ATTACHED TO ALL NIGHT TRAINS.

Spacious and Fine Saloon Cars!

WITH ALL MODERN IMPROVEMENTS, RUN UPON ALL TRAINS.

BAGGAGE CHECKED THROUGH TO ALL IMPORTANT POINTS.

☞ For Through Tickets, Sleeping Car Berths, Baggage Checks, and information, apply at the office of the Company in the Great Central Depot, foot of Lake St.

Hyde Park and Oakwoods Train.

	LEAVE.	ARRIVE.		LEAVE.	ARRIVE.
HYDE PARK TRAIN,...	*6:30 A. M.	*7.45 A. M.	HYDE PARK TRAIN,....	*3:00 P. M.	*5:15 P. M
HYDE PARK TRAIN...	*8:00 A. M.	*9.30 A. M.	HYDE PARK TRAIN,....	*6:10 P. M.	*7:35 P. M
HYDE PARK TRAIN,..	*19:10 P. M.	*1:45 P. M.			

* Sundays Excepted.

W. P. JOHNSON, Gen. Pass. Agent.

CHICAGO & NORTHWESTERN R. W.

Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.

ALL RAIL TO THE PACIFIC OCEAN!

Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:30 A. M. Clinton Passenger. | **10:00 P. M.** Night Mail.
10:45 A. M. Pacific Express. | **10:00 P. M.** Rock Island Pass.
10:45 A. M. Rock Island Exp. | **4:00 P. M.** Dixon Passenger.

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA,.....	23	$20.00	To SACRAMENTO,.	4½	$118.00
" DENVER,.....	52	65.00	" SAN FRANCISCO,	5	118.00

TRAINS ARRIVE:—Night Mail, 7.15 a. m.; Dixon Passenger, 11.10 a. m.; Pacific Express 4:15 p. m.; Rock Island Express, 4:15 p. m.; Clinton Passenger, 6:45 p. m.

FREEPORT LINE.

9.00 A. M. & 9.00 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.

4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, 2:30 p. m., 6:40 a. m.; Rockford Accommodation 11:10 a. m.; Geneva and Elgin Accommodation, 8:45 a. m.; Junction Passenger, 8:10 a. m.; Lombard Accommodation, 6:50 a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. DAY EXPRESS, for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.

3.00 P. M., Janesville Accommodation.

5.00 P. M. NIGHT EXPRESS, for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.

5.30 P. M., Woodstock Accommodation.

TRAINS ARRIVE:—7:00 a. m., 7:15 p. m., 9:00 a. m., and 2:05 p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,.....	8:15 A. M.
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,.....	9:45 A. M.
EVANSTON ACCOMMODATION,.....	1:00 P. M.
HIGHLAND PARK PASSENGER,.....	6:20 P. M.
MILWAUKEE ACCOMMODATION, with Sleeping Car attached.....	11:00 P. M.
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot.....	4:10 P. M.
AFTERNOON PASSENGER,.....	5:00 P. M.
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot.....	5:30 P. M.

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, 5:00 a. m.; Day Express, 4:15 p. m. Milwaukee Mail, 10:30 a. m.; Afternoon Passenger, 7:40 p. m.; Waukegan Accommodation, 8:25 a. m.; Kenosha Accommodation, 9:10 a. m.; Evanston Accommodation, 3.30 p. m.; Highland Park Passenger, 7.55 p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt. — **JOHN C. GAULT,** Gen'l Supt.

Milwaukee & St. Paul R. W.

THE ONLY ALL RAIL LINE TO

ST. PAUL AND MINNEAPOLIS!

AND ALL PORTIONS OF

Wisconsin, Minnesota & Northern Iowa.

PURCHASE TICKETS VIA MILWAUKEE.

Passengers Going via Milwaukee,

Have Choice of Seats in Clean Coaches, and on Night Trains, a full night's rest in Palace Sleeping Cars.

☞ BAGGAGE CHECKED THROUGH BY THIS ROUTE ONLY! ☜

PASSENGERS FROM CHICAGO can obtain these Advantages only by he MILWAUKEE DIVISION of the CHICAGO & NORTHWESTERN R'Y.

SPECIAL NOTICE.—Passengers destined to any place in Wisconsin, Minnesota, or Northern Iowa, either on or off the Lines of this Company, who cannot procure Through Tickets to their destination, should purchase their Tickets **TO MILWAUKEE,** as this is the Great Distributing Point for these States.

A. V. H. CARPENTER, Gen. Pass. Agt. Milwaukee. — **S. S. MERRILL,** Gen. Manager, Milwaukee

61 Miles the Shortest Line!

— FROM —

CHICAGO TO NEW YORK.

Pitts., Ft. Wayne & Chicago

— AND —

PENNSYLVANIA CENTRAL

IS THE ONLY ROUTE

Running its Entire Trains THROUGH to Philadelphia and New York, and the only Route running Three Daily Lines of Pullman Day and Sleeping Palaces, from Chicago to

PITTSBURGH, HARRISBURG,

PHILADELPHIA & NEW YORK,

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

BALTIMORE, PROVIDENCE, NEW HAVEN, HARTFORD, SPRINGFIELD, WORCESTER & BOSTON!

AND THE MOST DIRECT ROUTE TO WASHINGTON.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

		Mail.	Fast Express.	Pacific Exp.	Night Exp.
Leave—	CHICAGO	5.30 A. M.	9.00 A. M.	5.15 P. M.	9.00 P. M.
Arrive—	PLYMOUTH	9.50 "	12.03 P. M.	8.45 "	12.35 A. M.
"	FORT WAYNE	12.30 P. M.	2.05 "	11.15 "	3.10 "
"	LIMA	3.24 "	4.06 "	1.33 A. M.	5.40 "
"	FOREST	4.43 "	5.08 "	2.45 "	7.07 "
"	CRESTLINE	6.30 "	6.30 "	4.30 "	8.55 "
Leave—	CRESTLINE	6.00 A. M.	6.50 "	4.30 "	9.35 "
Arrive—	MANSFIELD	6.40 "	7.17 "	5.00 "	10.05 "
"	ORRVILLE	9.15 "	9.05 "	6.54 "	11.55 "
"	ALLIANCE	11.10 "	10.40 "	8.30 "	1.30 P. M.
"	PITTSBURGH	3.45 P. M.	1.55 A. M.	12.10 P. M.	4.40 "
"	CRESSON	11.57 "	5.44 "	4.48 "	10.00 "
"	ALTOONA	12.48 A. M.	6.55 "	5.55 "	2.40 A. M.
"	HARRISBURG	5.30 "	11.25 "	10.45 "	2.50 "
"	PHILADELPHIA	6.50 "	3.15 "	3.00 "	6.50 "
"	NEW YORK, VIA PHILADELPHIA	10.30 "	6.30 "	6.41 "	10.30 "
"	NEW YORK, VIA ALLENTOWN	10.30 "	6.30 "	.....	10.30 "
"	BALTIMORE	9.15 P. M.	3.05 "	2.30 A. M.	9.15 P. M.
"	WASHINGTON	1.00 "	5.15 "	5.45 "	1.00 "
"	BOSTON	9.00 "	5.50 A. M.	6.00 "	9.00 "

Boston and New England Passengers will find this Route especially Desirable, as it gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

☞ All New England Passengers holding Through Tickets will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, **Without Charge!**

THROUGH TICKETS for sale at the Company's Offices, at 65 Clark St.; 52 Clark St.; cor. Randolph and LaSalle Sts.; and at Depot, Chicago. Also at Principal Ticket Offices in the West.

CLOSE CONNECTIONS Made at LIMA for all Points on the Dayton & Michigan and the Cincinnati, Hamilton & Dayton Railways, and at CRESTLINE for Cleveland and Columbus.

Express Trains are Equipped with WESTINGHOUSE AIR BRAKES,

The Most Perfect Protection Against Accidents in the World!

F. R. MYERS, Gen. Pass. & Tkt Agt. P. F.W. & C. R'y Chicago.
W. C. CLELAND, Gen. Western Pass. Agt. P. F. W. & C. R'y, Chicago.

T. L. KIMBALL, Gen. Western Pass. Agt. Penn. Cen. R. R. Chicago.

Broad Gauge! Double Track!

ERIE RAILWAY.

4 EXPRESS TRAINS DAILY!

From Cleveland, Dunkirk and Buffalo, 625 Miles, to New York, WITHOUT CHANGE of Coaches!

☞ The Trains of this Railway are run in DIRECT CONNECTION WITH ALL WESTERN AND SOUTHERN LINES, for

Elmira, Williamsport, Oswego, Great Bend, Scranton, Newburgh,

NEW YORK, ALBANY, BOSTON, PROVIDENCE,

AND PRINCIPAL NEW ENGLAND CITIES.

New and Improved DRAWING ROOM COACHES are attached to the DAY EXPRESS Running THROUGH TO NEW YORK.

☞ **SLEEPING COACHES,** Combining all Modern Improvements, with perfect Ventilation and the peculiar arrangements for the comfort of Passengers incident to the **BROAD GAUGE,** accompany all night trains to New York.

CONNECTIONS CERTAIN! as Trains on this Railway will, when necessary, **wait from one to two hours for Western trains.**

All Trains of Saturday run directly Through to New York.

☞ **Ask for Tickets via Erie Railway,** which can be procured at **66 Clark Street** Chicago, and at all Principal Ticket offices in the West and Southwest.

L. D. RUCKER, General Superintendent, New York.
A. J. DAY, Western Passenger Agent, Chicago.
WM. R. BARR, Gen'l Passenger Agent, New York

Pan-Handle

— AND —

Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Sunday, NOVEMBER 20th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

7:40 A. M. DAY EXPRESS. [SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS	3:00 A. M.	HARRISBURG	10:35 P. M.	NEW YORK	6:40 A. M.	WASHINGTON	5:45 A. M
PITTSBURGH	12:15 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE	9:30 A. M.	BOSTON	5:05 P. M.

7:10 P. M. NIGHT EXPRESS. [SUNDAYS EXCEPTED.] Arriving at:

COLUMBUS	11:15 A. M.	HARRISBURG	5:20 A. M.	NEW YORK	11:40 A. M.	WASHINGTON	1:10 P. M
PITTSBURGH	7:25 P. M.	PHILADELPHIA	9.50 A. M.	BALTIMORE	9:30 A. M.	BOSTON	11:50 P. M

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

35 Miles the Shortest Route to Cincinnati.
18 Miles the Shortest Route to Indianapolis and Louisville

3 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Wheeling, Parkersburg, Evansville, Dayton, Zanesville, Marietta, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

7.40 A. M. (Sundays excepted) Arriving at

LOGANSPORT	1:15 P. M.
KOKOMO	2:33 P. M.
CINCINNATI	10:10 P. M.
INDIANAPOLIS	5:00 P. M.
LOUISVILLE	11:30 P. M.

8.05 P. M. (Saturdays excepted.) Arriving at

LOGANSPORT	1:15 A. M.
KOKOMO	2:31 A. M.
CINCINNATI	9:35 A. M.
INDIANAPOLIS	5:40 A. M.
LOUISVILLE	3:50 P. M

Lansing Accommodation: Leaves 3:40 P. M. Arrives 10:55 A. M.

PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets **via COLUMBUS** for the East, and **via "The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus.
I. S. HODSDON Northwestern Pass. Agt. Chicago.

D. W. CALDWELL Gen Supt. Columbus.

The Great Favorite Route for Missouri, Nebraska and Iowa.

KANSAS CITY, ST. JOSEPH

— AND —

COUNCIL BLUFFS

☞ THROUGH LINE! ☜

3 EXPRESS PASSENGER TRAINS Leave Union Depot Daily, on the arrival of Eastern Southern and Western Trains, crossing the Missouri River on the New Iron Bridge at KANSAS CITY, passing the cities of

LEAVENWORTH, ATCHISON, SAINT JOSEPH,

— AND —

NEBRASKA CITY.

Connecting at COUNCIL BLUFFS with Iowa Lines for all prominent points in Iowa, and making DIRECT CONNECTION at **OMAHA** with the Great **Union Pacific Railroad,** for

CHEYENNE, DENVER, SALT LAKE, SACRAMENTO, SAN FRANCISCO

And the Pacific Coast.

Pullman's Palace Sleeping Cars!

ON ALL NIGHT TRAINS.

☞ Ask for Tickets via the People's Favorite Route, **Kansas City, St. Joseph & Council Bluffs Railroad Line.**

A. L. HOPKINS, Gen. Superintendent ST. JOSEPH, Mo.
A. C. DAWES, Gen. Passenger Agent, ST. JOSEPH, Mo

LAKE SHORE
—AND—
MICHIGAN SOUTHERN R.W.

THE GREAT THROUGH LINE BETWEEN

CHICAGO, BUFFALO & NEW YORK,

WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

—BETWEEN—

CHICAGO & NEW YORK, via BUFFALO

☞ WITHOUT TRANSFER OF PASSENGERS! ☜

All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.

4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave CHICAGO from the New Depot, on Van Buren St., at the head of La Salle Street, as follow

5:30 A. M. MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 22d Street 7:45 A. M. Stops at all Stations. **Arrives**—Cleveland, 9:35 P. M.

9:00 A. M. SPECIAL NEW YORK EXPRESS,
VIA AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **9:15 A. M.** **Arrives**—Elkhart, 12:45 P. M.; Cleveland 9:45 P M.; Buffalo, 4:10 A. M.; New York, 7:00 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

THROUGH TO ROCHESTER, WITHOUT CHANGE!

IN DIRECT CONNECTION WITH

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty-Three Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leaves—Twenty-Second Street **5:30 P. M.** **Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper): arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (20 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (20 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 7:15 A. M.

9:00 P M. NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M.** **Arrives**—Toledo, 6:15 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:50 A. M.; Buffalo, 5:50 P. M.; New York, 12:00 M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 9:00 A. M. Arrive at Kalamazoo 4:10 P. M.; Grand Rapids, 7:10 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:25 A. M.; Grand Rapids, 10:15 A. M.

☞ There being no heavy grades to overcome, or mountains to cross, the road bed nd track being the smoothest and most perfect of any railway in the United States, this Company run heir trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

LAKE SHORE & MICHIGAN SOUTHERN R'Y.

THE ONLY LINE RUNNING THROUGH BETWEEN CHICAGO AND BUFFALO, WITHOUT TRANSFER, and in Direct Connection with NEW YORK CENTRAL RAILROAD and ERIE RAILWAY.

General Ticket Office for Chicago, No. 56 Clark Street.

CHAS. F. HATCH,
General Superintendent, CLEVELAND, OHIO

F. E. MORSE,
General Western Passenger Agent, CHICAGO.

GREAT CENTRAL ROUTE!

SPEED! COMFORT! SAFETY!

MICHIGAN CENTRAL
—AND—
Great Western Railways.

THE FAVORITE ROUTE, VIA NIAGARA FALLS, TO

NEW YORK, BOSTON,

AND ALL EASTERN POINTS.

Pullman's Drawing-Room Cars

FROM CHICAGO TO NEW YORK WITHOUT CHANGE.

CELEBRATED HOTEL CARS FROM CHICAGO TO ROCHESTER.

Passenger Trains leave Chicago from Depot, foot of Lake Street, as follows: (All Trains Stop at Twenty-Second Street Station to receive and leave Passengers.)

5:40 A. M. MAIL TRAIN, Sundays Excepted.
Has a car attached from Chicago going over both Main Line and Air Line Division, Without Change. Connects at New Buffalo for St. Joseph; at Jackson for Lansing, Saginaw and Bay City.

9:00 A. M. NEW YORK EXPRESS.
(SUNDAYS EXCEPTED.) Arrives at Michigan City at 11:10 A. M.; Niles, 12:20 P. M. [Dinner]; Kalamazoo, 2:10 P. M.; Marshall, 3:24 P. M.; Jackson, 4:30 P. M.; Detroit, 6:55 P. M. [Supper]; London, 11:25 A. M.; Hamilton, 2:35 A. M.; Niagara Falls, 4: A. M.; Rochester, 7:10 A. M. [Breakfast]; Albany, 2:00 P. M.; NEW YORK, **7:00 P. M.**; Springfield, 7:40 P. M.; BOSTON, **11:45 P. M.** This Train connects at ROCHESTER with

Wagner's Drawing Room Car through to New York without change!

Connects at Kalamazoo direct for Grand Rapids, Muskegon, Whitehall, &c., &c.

9:30 A. M. CINCINNATI & LOUISVILLE EXPRESS
(SUNDAYS EXCEPTED.) **Through Cars to Indianapolis and Cincinnati without Change.**

4:10 P. M. Kalamazoo, St. Joseph and Three Rivers Accom.
(SUNDAYS EXCEPTED.) Arrives at New Buffalo at 7:05 P. M.; St. Joseph, 8:40 P. M.; Kalamazoo, 10:05 P. M.; Three Rivers, 10:00 P. M.

5:15 P. M. ATLANTIC EXPRESS.
Leaves Daily. ☞ Arrives at Michigan City at 7:18 P. M.; Niles, 8:30 P. M. [Supper]; Kalamazoo, 10:40 P. M.; Jackson, 1:10 A. M.; Detroit, 3:45 A. M.; London, 8:35 A. M. [Breakfast]; Hamilton, 11:40 A. M.; Niagara Falls, 1:20 P. M.; Buffalo, 3:20 P. M.; Rochester, 5:10 P. M.; Albany, 1:30 A. M.; NEW YORK, **6:40 A. M.**; Springfield, 6:40 A. M.; BOSTON **11:00 A. M.** A MAGNIFICENT

PULLMAN DRAWING-ROOM SLEEPING CAR

IS ATTACHED TO THIS TRAIN DAILY, FROM

CHICAGO TO NEW YORK CITY.

☞ The Celebrated **HOTEL CAR** is also Attached to this Train from **CHICAGO** to **ROCHESTER.**

☞ **SPECIAL NOTICE.**—Boston and New England Passengers will please notice that thi Train now makes a direct connection through. A **Sleeping Car** is attached at Rochester at 5:30 P. M., running through to Springfield, Mass., thus avoiding transfer at Albany. Breakfast at Springfield. This Train reaches Springfield early enough second morning to CONNECT WITH ALL TRAINS up and down the Connecticut

6:30 P. M. CINCINNATI & LOUISVILLE EXPRESS
(SATURDAYS EXCEPTED.) **Through Sleeping Cars to Louisville without Change.**

This is the Only Line Running Sleeping Cars to Louisville!

9:00 P. M. NIGHT EXPRESS. Saturdays and Sundays Excepted
☞ Arrives at Michigan City at 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 3:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:45; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 5:40; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:25 A. M.; Rome, 1:55; Utica, 2:25; Albany, 6:30 A. M.; NEW YORK, **12:00 M.**; BOSTON, **3:30 P. M.**

A PULLMAN PALACE SLEEPING CAR

Is attached to this Train for **DETROIT.** This Train connects at **DETROIT JUNCTION** with **Grand Trunk Railway** for

MONTREAL, OGDENSBURG, &c.

9:00 P. M. Grand Rapids Express.
(SATURDAYS AND SUNDAYS EXCEPTED.) Arrives at Grand Rapids at 9:50 A. M.

An Elegant Pullman Sleeping Car

IS ATTACHED TO THIS TRAIN

THROUGH TO GRAND RAPIDS WITHOUT CHANGE!

Connecting there Direct to MUSKEGON, WHITEHALL, &c., &c.,

SPECIAL NOTICE.—The GREAT WESTERN RAILWAY of Canada have, during the past summer, put down 140 miles of New Rail, (a large proportion of the same being Steel Rails,) and otherwise improved their track, so that it can be truly said that it is in as good condition as any Line in the country.

☞ **Through Tickets** (and secured accommodations in Drawing-Room Sleeping Cars) can be purchased in Chicago at **60** Clark street (under Sherman House); at **48** Clark street (Grand Trunk Railway); at **53** Clark street (N. Y. C. R. R.); at office under Briggs House; at Great Central Depot, and at

General Office in Tremont House Block.

H. E. SARGENT,
Gen. Sup't M. C. R. R.

W. K. MUIR,
Gen. Sup't Gt. W. R'y.

HENRY C. WENTWORTH,
Gen. West. Pass. Agt. M. C. & Gt. W. R'y

NOTICES OF THE PRESS.

"Of great interest to railroad men."—[Delaware (O.) Gazette.

"Valuable because of its reliability."—[Holmesburg (Pa.) Gazette.

"A valuable encyclopædia of railway topics."—[The Stockholder.

"The best journal of the class published."—[Philadelphia Herald.

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"Well worthy the patronage of all intelligent railroad men."—[Kalamazoo Gazette.

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"The best informed railway newspaper published in the West."—[Aurora (Ill.) Beacon.

"Unquestionably the best railroad journal in the United States.—[Waukegan (Ill.) Patriot.

"Standing in the front ranks of railroad journals."—[Snow's Pathfinder Railway Guide.

"Makes a very handsome appearance and is full of valuable matter."—[Chicago Evening Post.

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"Of great interest to railroad men, and almost equally so to those who use railroads."—[Marshall (Mich) Statesman.

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"Every man who is at all interested in railroads would do well to take the GAZETTE"—[Jacksonville (Ill.) Independent.

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"One of the best conducted and most interesting railway journals published in this country."—[New Haven Railway Courant.

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110 and 112 Madison St., Chicago.

"Has always been one of the best papers of the country for railroad intelligence."—[New York Commercial and Financial Chronicle.

"Has always been one of the most valuable publications in the West * * * Is bound to continue its sway as the leading railroad journal of the country.—[Sedalia (Mo.) Bazoo.

"In its financial and commercial views in connection with the railroad interests of the country, may be regarded as one of the first papers of the United States."—[Pensacola Observer.

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"For railroad men and others wishing to keep themselves thoroughly posted on railroad matters we know of no better paper."—[Madison State Journal.

"One of our most valuable exchanges. * * * Its columns teem with reliable information of great benefit to railroad men of every section of the United States."—[Leavenworth Bulletin.

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